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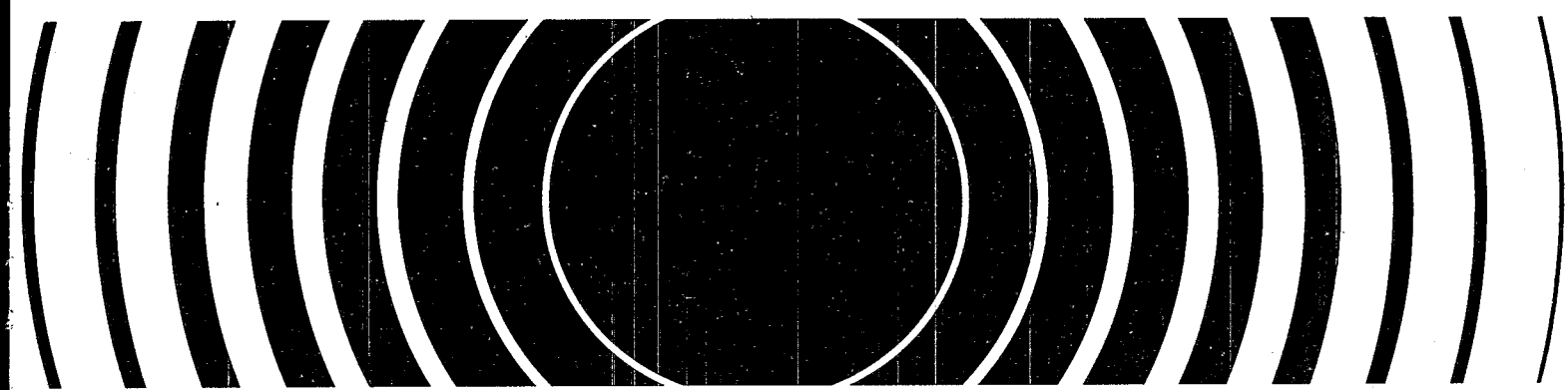
Comments and Response to Comments

NESHAPS for Radionuclides



40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

EPA 520/1-89-031

Comments and Response to Comments

Environmental Impact Statement for NESHAPS Radionuclides

BACKGROUND INFORMATION DOCUMENT

January 1990
U.S. Environmental Protection Agency
Office of Radiation Programs
Washington, D.C. 20460

Preface

The Environmental Protection Agency is promulgating National Emission Standards for Hazardous Air Pollutants (NESHAPs) for Radionuclides. An Environmental Impact Statement (EIS) has been prepared in support of the rulemaking. The EIS consists of the following three volumes:

VOLUME I - Risk Assessment Methodology

This document contains chapters on hazard identification, movement of radionuclides through environmental pathways, radiation dosimetry, estimating the risk of health effects resulting from expose to low levels of ionizing radiation, and a summary of the uncertainties in calculations of dose and risks.

VOLUME II - Risk Assessments

This document contains a chapter on each radionuclide source category studied. The chapters include an introduction, category description, process description, control technology, health impact assessment, supplemental control technology, and cost. It has an appendix which contains the inputs to all the computer runs used to generate the risk assessment.

VOLUME III - Economic Assessment

This document has chapters on each radionuclide source category studied. Each chapter includes an introduction, industry profile, summary of emissions, risk levels, the benefits and costs of emission controls, and economic impact evaluations.

Copies of the EIS in whole or in part are available to all interested persons; an announcement of the availability appears in the Federal Register.

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TABLE OF CONTENTS

1. INTRODUCTION

On March 7, 1989, the EPA published in the FEDERAL REGISTER (54 Fed. Reg. 9612) proposed National Emission Standards for Hazardous Air Pollutants (NESHAPs) for radionuclides emitted to air from 12 source categories. The proposal requested public comments on the proposed NESHAPs and the specific risk management approaches that were used to develop them. Informal public hearings were held in Washington, DC and Las Vegas, Nevada to give interested parties an opportunity to present their views, and written comments were solicited. Comments were received from almost 300 individuals and organizations representing state and federal agencies, public interest groups, industry and private citizens. This document addresses the comments relating to compliance procedures, modeling, risk assessment, and those specific to each source category. The EPA's response to comments addressing significant legal and policy issues are presented in Section VII of the preamble to the final rule on radionuclides, published at 54 Fed. Reg. 51654.

2. COMPLIANCE ISSUES

2.1 Point of Compliance

Concerns regarding this topic generally fell into two groups; those agreeing with determination of compliance based on maximum radionuclide ambient air concentration at the nearest residence but often disagreeing with EPA's exposure calculations as unrealistically high or low, and those who stated that some other point should be used.

2.1.1 Regulations based on the nearest exposed individual at maximum concentration appear to conflict with standards in Title 10 of the Code of Federal Regulations ("CFR"); these require controls which restrict radiation levels in any non-restricted area.

Response: The limits established by the NESHAPs apply to any member of the public exposed to ambient air emissions of radionuclides. As a practical matter, for most facilities this will be the nearest exposed individual at maximum concentration. Similarly, implementation of standards under 10 CFR to any non-restricted area assure that no member of the public receives a dose greater than the standards allow. Although the implementation is different and the facility will sometimes have to meet both standards, the NESHAP or the 10 CFR regulations that requires the lowest emissions will be controlling for that facility. In the context of NRC-licensed facilities, the EPA anticipates that any inefficiency that arises from the additional NESHAP implementation scheme will be mitigated through cooperation agreements entered into by the EPA and the NRC.

2.1.2 The NESHAP should be based on effective dose equivalent at the off-site point of maximum concentration regardless of whether a person currently lives there. This is necessary due to the limited ability of dispersion models to accurately predict concentrations at any given location and also because a residence may in the future come to be located at the point of predicted maximum ground-level concentration. Moreover, as a matter of policy, NESHAP decisions should be based on the conservative assumption that the nearest resident lives at the facility boundary or at the point of highest ground level concentration. Alternately, it has been suggested that a "critical group" approach be utilized as preferable to the moving target represented by the maximally exposed individual.

Response: The EPA's implementation procedures specify that the limit applies to the most exposed member of the population. This comports with the EPA's belief that its compliance and implementation modeling and procedures are capable of reasonable accuracy and are practical to use. This also implements the

EPA's policy that NESHAPs protect real persons. Moreover, since compliance is on an annual basis, should in the future some individual come to leave his or her residence located in the area of maximum concentration, that change in the MIR will be accounted for. The implementation procedures not only allow but require, the regulated community to specify the locations of nearby individuals. The compliance models then assess dose to the individual located at the point of highest environmental risk. The EPA believes this is consistent with its authority under the CAA.

2.1.3 Adjustments to the models or calculations so as to more accurately reflect the exposure of the maximum exposed individual to the activity being regulated are appropriate. These could include consideration of occupancy factors and building sheltering, temporal variations, particle size, air concentrations, etc. Monte Carlo modeling techniques of occupancy factors and other variables would give best estimate of risk and also the distribution of probable values about the risk estimate.

Response: The EPA's assessment and compliance codes do account for particle sizes and differing air concentrations due to dispersion as well as occupancy factors and building sheltering, but not temporal variations. The EPA has also performed uncertainty analyses using Monte Carlo techniques. The results indicate that while residency factors have a large influence on the estimated risk (factors of 10 to 15), the risk estimates used by the EPA are within 95 percent confidence interval.

2.1.4 The proposed regulation appears to limit airborne radionuclide emissions from a given facility. The wording on this is not very clear or consistently stated throughout the supplementary documents.

Response: The rules were developed to apply to individual sites where the release is from stacks or vents, and individual sources where the releases are from area sources such as mill tailings.

2.1.5 The hypothetical, maximally exposed individual is such an arbitrarily conceived concept that it serves no useful analytical purpose, and is assumed to be at the point of maximum exposure.

Response: The EPA disagrees. The maximum exposed individual identified in the risk assessment for 12 source categories, is not hypothetical as the EPA used all resources available, within the time constraints, in an attempt to ascertain where an individual actually lives and at what level that individual is exposed. This included demographic surveys, company reports, and

U.S. Geological Survey maps. In so doing, the location of the maximum exposed individual is not the point where maximum exposure occurs, but the location where an actual individual lives who receives the maximum annual exposure from the source.

2.2 ACCIDENTS

2.2.1 The final rule should specify the basis for coverage of accidents, any special provisions concerning treatment of accidents for compliance purposes, and the types of accidents included in EPA's supporting assessments for the proposed rule. Accidents are a special case and should be evaluated in the ample margin of safety checklist. Estimated radionuclide releases due to accidental release should be specifically included in the demonstration of compliance to the NESHAP and in the dose/risk assessment for new and modified sources.

Response: The issue as to what constitutes an accident and whether accidents must be differently treated from other hazardous pollutant emissions to ambient air, is not addressed by the CAA and has not been considered in the development of these standards. Nor are accidents anticipated to be considered when the EPA evaluates applications for modification or new construction. Therefore, accidents that result in the release of radionuclides in excess of the standard would constitute a violation that is enforceable by the Agency.

2.3 REPORTING REQUIREMENTS

2.3.1 EPA should specify more frequent record-keeping and compliance reporting requirements.

Response: The EPA believes that the specified record-keeping and annual reporting requirements are adequate. EPA is not aware of any additional environmental or safety benefits that would be derived from requiring additional records or more frequent reporting.

2.3.2 NESHAP standards for radionuclide emissions should apply for the calendar year rather than "...any period of 12 consecutive months...".

Response: The EPA disagrees as this measure is taken to more accurately reflect whether a facility is emitting excessive radionuclides into ambient air and thereby jeopardizing public health.

2.3.3 In seeking EPA approval for proposed construction and/or modification activity, the applicant should only be required to describe to EPA the proposal and its calculated increased emissions to ambient air. Some of the reporting requirements are

not clear and some may be needlessly complex. These should be clarified and, where possible, simplified through use of a 1 percent threshold compliance reporting limit and one-time reporting where appropriate.

Response: Applications for construction or modification are required to supply the information necessary to identify the activity and to justify the estimated impact upon public health due to the potential increase of radionuclide emissions. Reporting requirements have been simplified wherever possible. Appropriate threshold compliance reporting limits have been established.

2.4 MODIFICATIONS AND NEW CONSTRUCTION

2.4.1 The proposed threshold value of 1 percent of the standard for potential emission increases from modifications or new construction is unreasonably low. EPA approval should not be required unless the increase will exceed 10 mrem/yr. In the alternative, a 1 percent threshold based on a standard of 25 mrem/yr would provide considerable administrative relief. However, it should be noted that, although prior approval to construct or modify is not required for small dose contributors, start-up notification is still required and the annual report to the EPA must contain all the information in the application so there is no savings in paperwork.

Response: The EPA believes the threshold value of a potential emissions increase of 1 percent of the 10 mrem/y ede standard, above which EPA approval to construct or modify is required, is reasonable and proper. This has been added to the final rule as a result of comments to the proposed rules and should provide considerable administrative relief; trivial sources need not apply, but sources releasing significant amounts of radionuclides would be required to do so.

2.4.2 Permit use of the COMPLY code to determine whether an application need be made to the EPA for approval to construct a new source or modify an existing source.

Response: COMPLY may be used for this purpose.

2.4.3 The interpretation that any increase in radionuclide emissions triggers requirements of 40 CFR Part 52, PSD is especially troublesome; a threshold should be established, consistent with the approach for other priority air pollutants.

Response: The Agency is aware of this issue and is considering a threshold of that kind.

2.4.4 For the section "Distinction between Construction and Modification," the construction of a new building is now defined as new construction at the facility. Additional clarification should be added to this section. For example, is the expansion of an existing building to allow replacement of an existing process with new state-of-the-art equipment, which will not increase emissions, defined as new construction? One could say the expansion is a new building and that this constitutes new construction. Assuming that this is not new construction, if a new building to house the process is built adjacent to the existing facility, is this new construction?

Response: EPA is preparing detailed guidance for its regional offices and the states in dealing with situations such as these. If the facility is in doubt, it should contact the EPA regional office for clarification.

3. USE OF COMPUTER MODELS

3.1 General Comments

3.1.1 Use of AIRDOS-EPA, RADRISK, and other EPA-approved codes to demonstrate compliance should be permitted. The RADSCREEN Model is equivalent to COMPLY and should be accepted by the EPA as an alternative to COMPLY; documentation is available from the Ohio EPA on request. Any computer program used to demonstrate compliance should be peer reviewed, validated if appropriate, and meet nuclear quality assurance (NQA-1) requirements. The EPA should include a provision for approval of alternate programs.

Response: The EPA has devoted considerable resources and time to the development of the CAP-88 and COMPLY models for determining compliance. The intent of the COMPLY code is to assure the protection of public health while minimizing the data collection and input burden on affected licensees. While the EPA believes that these codes are sufficient for all licensees, it has provided for alternative compliance procedures to be used once they are submitted to the agency for review and approval. The EPA codes are available for peer review and have been widely distributed to the regulated community. There is no benefit in requiring compliance codes to meet nuclear quality assurance requirements.

3.1.2 Facilities with multiple sources should be modeled in a multiple source mode with radionuclide emission parameters representative of each individual source; AIRDOS-EPA model cannot accommodate sources at more than a single physical location.

Response: The AIRDOS-EPA model does co-locate multiple stacks. For compliance purposes, where only the exposure of the maximum individual is required, multiple code runs can be made to more exactly calculate the contribution to dose from widely separated sources to a single location. Guidance on performing such multiple calculations is available by contacting the EPA's Office of Radiation Programs.

3.1.3 In general, area sources are not monitored by measuring the radon flux; most of the time boundary measurements are made. A more uniform approach would be to base the limit on the total curies released per second per site; another method would be to base the limit on the concentration of radon in the air at the site boundary.

Response: The EPA is fully aware that radon releases from area sources are only infrequently monitored by direct measurements on the source. The standards that the EPA has promulgated for such sources (i.e., inactive phosphogypsum stacks, uranium mill tailings disposal sites, and DOE Radon sites) specify design

basis radon flux rates per unit area, to be confirmed by post-remediation monitoring of the flux on the source.

3.1.4 Approach A should be modified to include the NAS recommendations of measurements of actual radionuclides rather than following the current practice of placing undue reliance on general models.

Response: At the levels established by the NESHAPs, concentrations of many radionuclides may be difficult to distinguish from natural background levels or below the limits of detection of even state-of-the-art detection systems. Therefore, the Agency will continue to rely primarily upon modeling techniques to assess the risk of radionuclides released into the ambient air.

3.1.5 Existing air emission monitoring equipment and methodology should be allowed to remain in service for DOE's and NRC-licensed facilities provided emissions from the source do not account for more than 1 percent of the permitted value for the facility.

Response: The EPA has reviewed the existing monitoring and analytical procedures for both DOE and NRC-Licensed facilities. Based on these reviews, the EPA has determined that existing procedures, as specified or referenced in each licensee's technical specifications, are satisfactory and may be used.

3.1.6 There are no instruments or proven techniques available for monitoring some of the isotopes at the detection levels necessary to comply with the proposed standards.

Response: Absent specific examples, the Agency is unable to determine the accuracy or significance of this comment. However, the NESHAPS are promulgated with the provision that alternative methods of determining emissions may be submitted to the Agency for review and approval.

3.1.7 The EPA should allow use of certified test results as an alternative to the adjustment factors in Table 1 of Appendix D.

Response: The Agency believes that most licensees will be able to demonstrate compliance simply by using the approval adjustment factors. However, the EPA will allow the use of factors based on "certified" test results when the pertinent data relating to the certification and details of the certification tests are submitted to the agency for review and approval.

3.1.8 Regulated facilities should be required to acquire and utilize in emissions models site specific meteorological data.

Response: Sensitivity analyses of meteorological data sets have shown that the variation between data sets is relatively small.

The EPA sees little benefit to the public health and safety to be gained by requiring site-specific meteorological data versus data from the nearest station.

3.1.9 Population data for performing dose/risk assessments are based upon United States census tract data. What base year census data is used to perform these analyses? Are the data adjusted to account for population growth in the period after the census was taken?

Response: The assessments use 1980 census data for the 0-80 km population estimates, augmented where noted by site-specific data for the nearby individuals. No adjustment to the census data has been made.

3.1.10 The EPA numbers are not real deaths, nor should they be considered as such. The numbers are nothing more than a statistical calculation and have little or no relevance in biological or public health terms.

Response: The EPA is fully aware of the statistical nature of the risk numbers that it calculates. However, it strongly disagrees that the estimates have no biological or public health significance. There is a broad consensus in the radiation protection field that the approach used by EPA is prudent and appropriate for risk calculations in the radiation field. In addition, this methodology has been reviewed and accepted by the SAB.

3.2 Use of Dose Response Models in Risk Assessment

3.2.1 The linear non-threshold Dose Response Model is overly conservative and does not represent scientific consensus when used to extrapolate to the extremely small doses allowed in the proposed rulemaking. BEIR III specifically cautions against extrapolation of its risk estimates to such low doses (i.e., less than 100 mrem/year) due to the high degree of uncertainty. No scientific studies to date have been able to prove or disprove that health effects occur at doses below a few hundred millirem per year. Consequently, risk coefficients applied to such low doses become so uncertain as to be meaningless

Response: Although the EPA acknowledges the comment that linear non-threshold dose response model is often considered overly conservative and not representative of a scientific consensus, some dose-response relationship must be assumed or dose and risk cannot be effectively determined. (ICRP #26, par 27,28). The Agency believes this assumption is reasonable and realistic and

has more adequate scientific support than for any other hypothesis. The Agency has also tried to quantify the sources of uncertainty in the risk factors produced and has indicated the range of uncertainty in the risk factor. Model uncertainty is one of the uncertainties subsumed in this range.

3.2.2 The EPA has ignored recommendations made by its own Science Advisory Board. The EPA is in error in treating risk estimates as scientific fact. Conservative best guess estimates must be clearly identified as such when presented to the public and decision-makers. In general, the EPA's risk methodology fails to represent the scientific community inasmuch as it ignores other models which more closely represent scientific observations. The preferred approach is to present a range of values corresponding to various accepted dose response models so that decision-makers can be informed as to the lack of certainty in risk estimation.

Response: The Agency believes it has followed the scientific recommendations of the SAB to the greatest extent possible. The central value risk coefficients, response projection model, and range of risk used by the Agency have been endorsed by the SAB. Moreover, the Agency disagrees with the suggestion that it has ignored superior models or that it has engaged in improper decision-making.

3.2.3 The EPA uses a lifetime fatal cancer risk of 400×10^{-6} per rem. The justification of this value is insufficiently supported and does not agree with risk coefficients proposed by BEIR III, ICRP, NCRP.

Response: The risk factor of 400×10^{-6} fatal cancers per rem is the estimate developed using the BEIR III linear, relative risk model. It would also be about the number developed using the linear relative risk model, risk coefficients from the UNSCEAR 1988 Report and a dose rate effectiveness factor of 3. The ICRP risk estimate is over 18 old and does not represent the best of the current scientific information on the subject. The NCRP has not made a numerical estimate of cancer for total body gamma exposure.

3.2.4 The EPA's lifetime risks (Table 3) are inconsistent with previously published lifetime occupational risks.

Response: Agency estimates of lifetime risk of cancer should not be expected to be consistent with occupational risk estimates. The Agency estimates population risk, birth to age 110 in a lifetable; occupational risk estimates are for ages 18-65.

3.2.5 Although Volume I of the BID addresses teratogenic and genetic risks, it is not clear whether these risks were considered in combination with the carcinogenic risks in the proposed emission standards.

Response: The Agency calculates genetic and teratogenic risk factors. In the NESHAPs assessments the genetic and teratologic risks were inconsequential compared to both the risk of carcinogenesis and the overall uncertainty in the estimates. They were not specifically quantified in the risk assessment.

3.2.6 EPA's risk estimates do not include updated information for Japanese A-bomb survivors with regard to mortality data and changes in dosimetry, nor do they reference more current risk estimates such as BEIR V, UNSCEAR 86 and UNSCEAR 88.

Response: The Agency is familiar with the new data from Japan addressed in Shumizu et al (Rad. Research 118: 502-524 (1989) and RERF Technical Report 5-88 (1988), Stather, et al (NRPB publication, NRPB-R226 (1988)) and the UNSCEAR 1988 Report. The revised BID will show how this new data may affect Agency radiation risk estimates. However, the Agency is awaiting a review and analysis of the BEIR V Report with risk coefficients calculated for North Americans, before attempting to revise Agency risk coefficients. The final BID (or FEIS) discusses the genetic risk estimates given in the UNSCEAR 1986 and 1988 Reports.

3.2.7 The EPA's reason(s) for electing an RBE of 2.7 for gammas for genetic effects is not sufficiently substantiated.

Response: Although the support for an RBE of 2.7 is not overwhelming, additional reference that the genetic effects of alpha emitters are no greater than those due to acute x-rays can be found in the UNSCEAR 1986 Report (par 402 page 87 and par 428 page 91). The risk from acute gamma or x-ray exposure was reduced by a factor of 3 to give the estimate due to chronic exposure, as noted in the BID. This is equivalent to using an RBE of 3.

3.2.8 For teratogenic effects, the new DS 86 dosimetry suggests a threshold for the developmental period of 8 - 15 weeks in the range of 10 to 20 rads.

Response: The Agency agrees. However, the conclusion is too uncertain to require a revision of risk coefficients at this time (Otake, et al, RERF Technical Report TR 16-87). For instance, only nineteen cases of mental retardation, distributed across six dose categories in the 8 to 15 week exposure group, comprise that data base. Perhaps the new cases of mental retardation identified (Otake, et al, RERF Technical Report TR 16-87), or the new data on IQ decrement (Otake, et al, RERF Technical Report TR

2-88; Schull, et al, RERF Technical Report TR 3-88) will help resolve this problem. Current scientific consensus on appropriate models for radiation risk projection has selected the relative risk model. The NCRP model is an absolute risk model. In addition, the NCRP risk factor is based on 1975 vital statistics. Generally speaking it is of historic interest but has been superseded by newer risk models and theories.

3.2.9 The EPA fails to explain why it believes the NCRP 78 radon risk estimate is outside the lower bound. Therefore, the EPA's radon risk coefficient of 360 x 10^{-6} per WLM may be on the high side since EPA did not include the NCRP value (I-91, I-143).

Response: The NCRP 78 model was rejected because (1) the assumed temporal dependence on risk--exponential decay of absolute risk--does not appear to be consistent with the epidemiological data (see BEIR IV); (2) the risk model is not properly normalized, further reducing the risk estimate by about one-third; and (3) the model fails to take into account the evidence for a synergism between smoking and radon. The assumed time dependence with its incorrect normalization leads to a substantial underestimate of the risk for the general population. Because the model does not consider smoking, it assigns the same risk to nonsmokers as smokers; as a result, its risk estimate for nonsmokers actually exceeds that obtained with the BEIR IV or ICRP 50 model.

3.2.10 The EPA's radon risk coefficient of 360 x 10^{-6} per WLM is based on BEIR IV and ICRP 50. Both BEIR IV and ICRP 50 estimates are relative risk models and assume a multiplicative interaction with smoking. However, the models differ with regard to time since exposure. This results in BEIR IV (and the EPA) adopting a methodology which is biased toward underestimation of exposure and hence overestimation of risk.

Response: This comment has been considered in light of both comments that say that the exposure of the US miner cohort was underestimated, and those that say the exposure is overestimated. However, the U.S. cohort is only one of four analyzed in BEIR IV or one of three in ICRP 50. The BEIR IV and ICRP 50 models are the authors best fit to their preferred model. While neither may be proven correct in the future, they are the current best estimate models.

3.2.11 The EPA, by using BEIR IV risk coefficients, does not adequately account for smoking as a confounding variable in estimating the lung cancer risks posed by exposure to radon. Since smoking was more likely prevalent among miners and since smoking is a potent lung carcinogen, the validity of the measurements of the much weaker radon dose response signal in the range of 0 - 300 WLM is in doubt.

Response: The EPA is aware that it is possible that a weakness to BEIR IV rests in the fact that smoking may be a confounding variable. When full smoking data is collected for the various cohorts, which has not been done as of this date, reanalysis may allow more detailed account to be taken of the radon-smoking interaction.

3.2.12 The miner exposure data used by BEIR IV are not measured values, only a small fraction of miner exposure data represents measured exposure. It is likely that these calculated exposure values overestimated true exposures.

Response: While not all exposure estimates are based entirely on measured data, there is no evidence that the calculated estimates either overestimate or underestimate exposure.

3.2.13 Of the four miner cohort data sets used to estimate the radon risk coefficient, there are two data sets for which there is an excess risk at zero excess exposure; incorrect dose assignment has been postulated as one possible cause. For the Eldorado miner cohort, the dose assignments are much lower than was actually experienced which leads to inflated risk coefficient. Thus, a 54% excess risk at zero exposure is included in the dose-response plot. The Malmberget data from Sweden also show as excess risk at zero dose intercept. These two data sets should, therefore, not be used until these problems are corrected by the renormalization of data.

Response: The Agency disagrees. The commenter provides neither adequate justification nor detailed explanation capable of supporting its position.

3.2.14 For radionuclides other than radon, the EPA distinguishes between fatal and non-fatal effects. The EPA has not explained why it assumes all radon induced lung cancers are fatal.

Response: Lung cancer is fatal with 95% or more of cases dying within a year or so of diagnosis. For the draft BID, only fatal lung cancers were calculated and listed in the case of radon exposure. In the case of low-LET exposure or deposited radionuclides, for many organs, 50% or less of the cases are fatal, so both fatal and non-fatal cancers exist. This is reflected in the BID in Tables 6-8 and 6-9 where mortality and incidence are tabulated by organ and age.

3.2.15 The uncertainties associated with the calculated risk estimates are not reflected once the risk estimate is carried forward for use in making regulatory decisions.

Response: The EPA disagrees. The uncertainties and other limits to risk assessment are fully articulated and considered in the decisionmaking of the final rule.

3.2.16 Dr. Radford provided observations regarding total risks for the Ontario uranium miners and the Czechoslovokian uranium miners. There populations are showing very similar risks. Instead of the risks coming down as purported in BEIR IV, the risk estimates continue to go up or, at least, stay the same. This data is backed up by bigger studies, more complete and extensive, but of shorter duration.

Response: We agree that the tempered dependence of risk following radon exposure is still uncertain. Further followup of all miner cohorts are desireable and should continue in order to settle this question.

3.2.17 The value of 730 deaths per 10^6person-WLM attributed to BEIR III cannot be found in BEIR III. The actual figure, as noted by the EPA, is 440 deaths. Tables 1-1 and 2-13 of BEIR IV, and Table 6-12 of the BID are misleading.

Response: The 730 number is based on the effective working level months, a concept EPA no longer uses.

3.2.18 The reference in the draft BID at 6-36 to the risk factor of 830 fatalities per million person-WLM as being an Atomic Energy Control Board of Canada (AECB) estimate for lifetime exposure to Canadian males is incorrect; the value cannot be found in the cited source, the estimate was not accepted by the AECB, and the so-called best estimate is really the upper end of the range of risk values.

Response: EPA modifies the AEC BC value (see section 6.4.3, vol. 1 of the BID.

3.2.19 The EPA risk analysis should utilize the 40+ years of exposure data based on real people and real situations is available in the records of DOE and NRC (and predecessor agencies) (I-163)

Response: EPA's risk factors are based on human epidemiological studies of many kinds, including the atomic bomb survivors. The Agency knows of no definitive studies of NRC and DOE personnel that would significantly improve this data base.

3.3 The CAP-88 RISK ASSESSMENT CODE

3.3.1 The AIRDOS code is limited in its treatment of multiple release points and area sources. These limitations include the facts that all area sources are treated as circular, multiple

release points (whether stack or area sources) are co-located at the origin of coordinates, and it is questionable if the code can be used for receptor distances which are less than 2.5 the radius of the effective circular source.

Response: The EPA's CAP-88 assessment codes are limited with respect to multiple release points and do treat all area sources as circular, but have the advantage of practicability. Sensitivity studies have shown that these modeling simplifications have little impact on estimated population exposures. Nevertheless, with respect to maximum individual exposures, the co-location of all sources at a given site may sometimes either over- or under-estimate doses and risks depending upon the release location selected. The CAP-88 assessment codes may be used to assess exposures within 2.5 times the effective radius of an area source.

3.3.2 Releases are treated as point sources in calculating exposures which could result in an incorrect estimate of potential exposure for sites with many sources or covering large areas.

Response: As noted in II.2.1, the accuracy that is obtained from the CAP-88 codes is more a function of carefully selecting the release location for sites with multiple release points. The treatment of dispersion for area sources is not affected by the size of the area source.

3.3.3 Dose is calculated at the point of highest air concentration at ground level which for large sites results in dose estimates to the public at locations within restricted areas of the site.

Response: The commenter is mistaken. The maximum individual exposures and risks reported in the FEIS are either at the point of maximum off-site dose where detailed demographic data are not available, or at the occupied location of highest risk where such data are available.

3.3.4 Use of a Gaussian Plume Dispersion Model limits the application of the model in simulating transport and dispersion over complex terrains where terrain-induced flows can result in significant horizontal and vertical variations in wind speed and direction.

Response: The EPA is aware of the limitations of the Gaussian Plume model for complex terrain, and is working to develop assessment models that provide alternative dispersion models. However, until such time as these models are working and documented, the Agency will continue to rely upon the estimates obtained from the AIRDOS/DARTAB/RADRISK models. Validation studies of the dispersion portion of the code, which have

included sites located in complex terrains, have shown that the predicted air concentration are sometimes greater and sometimes lower than field measured values.

3.3.5 There are no provisions for surface perturbations, such as strong relief or surface roughness, nor particle resuspension.
Response: Although the CAP-88 codes do not directly account for these factors in estimating environmental concentrations, in general, these are second order corrections that do not significantly affect the estimated concentrations and risks.

3.3.6 The set of radionuclides available for use (RADTAB data set) does not include all radionuclides produced by all facilities to which the model must be applied, specifically accelerator/research reactor products and those produced in medical uses are not included.

Response: The CAP-88 code includes all radionuclides likely to be produced in airborne emissions from accelerators, research reactors and from medical uses of radionuclides.

3.3.7 The assumptions regarding emission stack height, temperature, flow rate, etc. make no provisions for site-specific.

Response: The CAP-88 assessment codes do allow for the input of site-specific data regarding release height, stack temperature, and/or flow rates. While the codes do not allow for both momentum and buoyant plume rise, this is generally not a significant limitation. Where default values are used for these parameters it is due to the fact that the EPA has not been able to develop and substantiate site-specific data.

3.3.8 The food pathway has no provision for considering pigs, goats, goat's milk, or poultry.

Response: The Agency believes that consideration of cow's milk and beef for the ingestion pathway is sufficient to estimate the likely exposures resulting form the consumption of all foodstuffs.

3.3.9 The EPA's computer model should be upgraded to reflect state-of-the-art as recommended by the Science Advisory Board.

Response: The EPA is working on the development of its assessment codes. However, given the deadlines established by the Court's, this rulemaking cannot be delayed until the new codes become available.

3.3.10 CAP-88 should include a screening procedure to be used to determine whether a detailed analysis should be performed.

Response: The EPA disagrees. The CAP-88 code is approved for use by DOE Facilities. The quantities of radionuclides handled at these sites and the existence of site-specific demographic and meteorological data make it reasonable to use the CAP-88 code to determine the levels of exposure caused by airborne emissions.

3.3.11 The COMPLY program may indicate that the same facility is both in compliance and not in compliance, depending on how the data is described. For example, treating an entire stock of an isotope as one form will enormously change the compliance levels.

Response: Since the facility is required to put the data into the correct form of isotope, EPA does not consider there to be a problem with determining compliance.

3.3.12 Very conservative assumptions have been made in an effort to keep the model simple; the result is that the calculated population dose is significantly higher and less accurate than that calculated by other methods currently in use.

Response: COMPLY does not calculate doses that are significantly less accurate than other methods that are currently in use. Major differences in dose estimates stem from the fact that ICRP 2 methodology is required by the NRC for certain licensees.

3.3.13 Monte Carlo methods can be used to take into account uncertainty in the calculation of potential risk to the MIR posed by radon emissions (from mill tailings).

Response: The Monte Carlo technique has been employed to estimate uncertainty to the MEI posed by radon emissions. The results have been presented in Volume I of the final BID (FEIS).

3.3.14 For U-238, Th-230, Ra-226, and Pb-210, the EPA's risk factors are greater than those given by the ICRP by an average factor of 2.5.

Response: EPA's risk factors for the above radionuclides are based on organ specific risk models (chapter 6 of Vol. 1 of the final BID) and are believed to be realistic for long term chronic exposure. They are higher than those used by the ICRP.

3.3.15 EPA has accepted ICRP models for alpha-emitting bone seeking nuclides which yield incorrect dose/risk values.

Response: EPA believes its dose/risk models for alpha-emitting bone seeking radionuclides are reasonable. (Chapter 6 of Vol. 1 of the BID).

3.3.16 In its discussion of organ weighing factors, the EPA does not specify which organs correspond to "remainder of organs".

Response: The remainder category includes all other ICRP target organs that were not listed.

3.3.17 The EPA's dosimetry model for immersion dose to direct plume exposure ignores high energy gamma dose from overhead plume for locations close to an elevated release.

Response: This is true, but this is seldom an important consideration. When it could be, we do not use an elevated release for compliance calculations.

3.3.18 The EPA does not apply a dose rate effectiveness factor (DREF) which may reduce risk for low-LET doses by a factor of 2 to 10.

Response: The Agency is not persuaded that it is prudent to use a low dose rate effectiveness factor for low LET radiation with respect to all kinds of human cancers. This issue is discussed in detail in Section 6.2.3 of Vol. 1 of the final BID.

3.3.19 The f_1 values for short-lived Pu-238, 240, 242 are different than those published by the ICRP in Publication 48. Why has the EPA adopted these values?

Response: These values were used in our 1975 guidance for protecting the public from transuranics. However, the EPA is currently revising its values to conform with the ICRP 48 recommendations, which are numerically similar.

3.3.20 The EPA's assumption of a 570 gram lung target region conflicts with the ICRP's recommendation of averaging over the entire 1000 grams of lung tissue.

Response: The EPA averages the dose over the entire lung using ICRP contemporary models. However, for estimating the risks, the EPA considers only the dose to the pulmonary region.

3.3.21 There is an inherent contradiction in the EPA's assessment methodology. It assumes an individual spends 24 hours/day outside for 70 years in calculation of risk from particulate radionuclide emission, however in calculating indoor radon exposure risk, it assumes 75% of the individual's time is spent indoors.

Response: As a practical matter, there is no contradiction. EPA assumes very small particulates enter residences without hinderences, behaving like air.

3.3.22 The EPA's assumption that the radon decay product concentrations in the air transported from the radon source to the receptors is in significant state of equilibrium with the parent radon is very conservative.

Response: The EPA calculates the equilibrium fraction as a function of distance. This simplification, which uses a uniform wind speed to relate distance to time, greatly reduces the calculational resources needed to compute precise equilibrium fractions. The Agency does not believe that this simplification greatly over- or under-estimates the equilibrium fraction at a given location.

3.3.23 The definition for "effective dose equivalent" is inaccurate - "effective dose equivalent is not a "risk-weighted average" but the sum of the risk-weighted organ dose equivalent commitments.

Response: The definition has been corrected in the final documentation.

3.3.24 The EPA emission factors and the NCRP screening model assumes that the nearest resident is at 10 meters and food production at 100 meters. This negates the assumption on page 9617 that stack height and area/facility size have negligible effects because they will have effects at these distances. In real life, we have not seen residents living at 10 meters or food production at 100 meters from facilities releasing significant quantities of radionuclides.

Response: The commenter is mistaken, neither the EPA emission factors nor the NCRP's screening models are based on the stated assumptions. The EPA did base the Table of Allowable Quantities on the assumption that no individual resides within 10 meters and no food is grown within 100 meters. Facilities, if they exist, which do not meet this condition, are prohibited from using the Table to determine compliance. Levels II through IV of the COMPLY code to consider building wake effects.

3.3.25 Does EPA assume that the regulation is geared towards protecting people in residences only based on the 10 meter release point? What about offices, factories, etc. - are they considered occupied residences?

Response: The regulations cover any member of the general public. The Table of Allowable Quantities was developed to minimize the burden of demonstrating compliance on small licensees while assuring the every member of the public received the full protection provided by the standards.

3.3.26 Section IV.D.2. apparently does not address precipitation which may have a significant affect on the dispersion of pollutants in some parts of the country.

Response: Level 4 of the COMPLY computer program has been revised to take precipitation into consideration.

3.3.27 While the emission factor specified may be appropriate for known volatile compounds of H-3 or iodine isotopes, we do not believe that it could be defended for elements which have no known volatile or gaseous compounds. This factor should be re-evaluated and reduced where appropriate.

Response: The release fractions were developed as a means of minimizing the burden of demonstrating compliance while assuring the public health is protected. Thus, the emission factors represent upper-bound limits. If a licensee cannot demonstrate compliance on the basis of the release factors and the effluent control adjustment factors, then monitoring is both appropriate and required.

3.3.28 The measurement methods in the proposed rule should be used as guidance only, i.e. acceptable but not required methods. Radiation measurement technology is constantly changing and facilities should have the explicit permission to adopt new better techniques as they become available.

Response: The Agency has amended the measurements methods to include those already approved by the NRC. However, it has not dropped the requirement that use of other methods be approved by the Administrator.

3.3.29 The SAB recommends against "deliberately producing biased measurements" when demonstrating compliance, that is the result that would occur using COMPLY.

Response: An uncertainty analysis, using a Monte Carlo simulation technique, in support of this rulemaking suggest that the CAP-88 codes produce median risk (or dose) values on an annual basis. While the lower levels of COMPLY are conservative, Level 4 produces results that are not biased and are similar to those calculated by the CAP-88 codes when the receptor is outside the building wake zone. At close distances, COMPLY calculates different air concentrations due to inclusion of building wake effects.

3.3.30 Considering that accidental releases are included in annual emissions, the EPA should include some additional provisions in its compliance procedures for dealing with accidents.

Response: Accidental releases that are not catastrophic can be adequately handled by the present codes. If the accident is catastrophic, then compliance with the NESHAPS would be mute and the EPA's Protective Action Guidelines should be applied.

3.3.31 The COMPLY code does not employ a finite modeling approach but calculates only doses from air immersion/inhalation which will tend to underestimate doses from an elevated release and overestimate doses from ground releases.

Response: To the extent that the EPA understands this comment, it disagrees. The COMPLY code can be applied to both ground level and elevated releases, and calculates doses based on air immersion, ground-surface contamination, inhalation, and ingestion.

3.3.32 The COMPLY computer code has no provisions for site-specific meteorology and topographical information.

Response: The commenter is misinformed. The COMPLY code has not provision for site-specific meteorological data at the lowest levels. Level 4 of COMPLY allows for using site-specific meteorological data in the form of a modified wind rose showing how frequently the wind blows from a given direction at a given wind speed. Although the code is unable to consider topographical details such as surface roughness, it does take into consideration building wake effects. Building wake effects will be more important than other terrain characteristics for most facilities in the NRC-Licensed category.

3.3.33 The COMPLY code does not allow for stability classes for calculating dispersion.

Response: Consistent with the recommendations of the NCRP, the COMPLY code assumes stability class D. This assumption makes a small difference in most cases and was adopted because it greatly simplifies the use of the code.

3.3.34 The COMPLY code only provides for one farm at one distance and that distance is applied in all 16 sectors.

Response: This assumption has been adopted to simplify the code.

3.3.35 The COMPLY code has no provision for time dependence to accommodate for cows on pasture versus cows on stored feed.

Response: Simplifying assumptions have been intentionally incorporated into the COMPLY code. Some of these assumptions tend to overestimate risk (residence at one location for 70 years), while other assumptions may underestimate risk to selected populations (infants and children). The dose calculated by COMPLY is not an actual dose but a dose for determining compliance with the NESHAP.

3.3.36 The COMPLY code accepts only information as to the nearest receptor in each of 16 sectors. The closest receptor may not always be worst case.

Response: The nearest receptor is at the maximum air concentration in COMPLY because the Gaussian dispersion factors use the concentration at the point where the plume touches down for distances located closer to the point of the release.

3.3.37 The EPA must clarify instructions as to the meaning of "maximum annual air concentration". This could be interpreted to mean location with highest annual average air concentration, location with highest 95th percentile Chi/Q or even location with highest single concentration reported during the year.

Response: No clarification is necessary. The "maximum annual air concentration" can be interpreted as the point closest to the point of release. Although the plume may come down beyond this point, the diffusion factors used provide for a constant concentration from the point of release to the point where the plume touches down.

3.3.38 Requiring the use of the COMPLY code by the nuclear industry disregards the existence of a carefully developed and very rigorous methodology already in existence for calculating risk to offsite individuals, and will result in different values being calculated and reported to EPA than are reported to NRC under guidelines of NUREG 0133, Regulatory Guide 1.109.

Response: Much of the NRC's existing framework is outdated, incomplete, and inconsistent. For material licensees and power reactors, the NRC uses the outdated ICRP 2 methodology to calculate doses. Further, building wake effects, accidental releases, and the contributions from radon decay products (notably Po-210 and Pb-210) are not included. For uranium milling facilities, the NRC used ICRP 26/30 methodology, while the EPA's AIRDOS methodology is used for conversion plants. It would be difficult for the EPA to be consistent with this system.

3.3.39 The COMPLY code and thorough documentation should be made available for evaluation and to allow demonstration of compliance with the regulations.

Response: The COMPLY code is extremely well documented. The methodology and equations used through Level 3 are from the NCRP's Commentary No. 3. The COMPLY code and Level 4 are

described in the EPA's Background Information Document "Procedures Approved for Demonstrating Compliance with 40 CFR Part 61, Subpart I. The Agency has not releases the source code for COMPLY to preclude the distribution of unauthorized versions.

3.3.40 The COMPLY code's requirement to calculate the building wake factor at distances beyond which there is a wake is unnecessary and should be deleted.

Response: The requirement is based on the recommendations of the NCRP in its Commentary No. 3. The Agency has no information indicating the correction is unnecessary.

3.3.41 The COMPLY computer code should be modified to allow use of the radioisotope and curie file for each release point so that if the program needs to be rerun these data could then be available without re-entry.

Response: The COMPLY computer program is intended for compliance. The EPA does not encourage many reruns of the code to achieve compliance.

3.3.42 In running the COMPLY computer program, it is not clear what is meant by "multiple emission vents". Can one emission point that represents the average flow conditions and accounts for all radionuclides emitted be used rather than considering 10 release points separately? Dow believes an operator should be allowed to aggregate emission points. This should not effect final results, but will make the running of the program much easier.

Response: Separate release points can be used if they are not far apart in comparison to the distance to the receptor.

3.3.43 Additional means for determining compliance should be considered by the EPA.

Response: The EPA is allowing provisions for approving alternative models that are equivalent to COMPLY.

3.3.44 The EPA assumes that radionuclides build up in the surrounding area for 100 years, rather than a more realistic 25-year period, before the exposed population comes into existence. This increases estimated ground concentrations, surface doses, and vegetation concentrations by a factor of three.

Response: EPA uses a 35 year half-life value for long half-life radionuclides on the ground, which modifies the ground build-up in surrounding areas.

4. SOURCE CATEGORY SPECIFIC COMMENTS

4.1. DOE FACILITIES

4.1.1 Basis for the Standards (legal/procedural issues)

4.1.1.1 DOE proposes under Subpart H a 25 mrem/yr effective dose equivalent standard for emissions to the air from DOE facilities. The selection of an "acceptable level of risk" for air emissions at 25 mrem/yr effective dose equivalent is more consistent with the recommendations of national and international radiation protection standards-setting organizations than the levels considered by EPA in the proposed rule.

Response: The Administrator has considered the recommendations of both the national and international advisory committees in reaching decisions on what constitutes safe with an ample margin of safety. The 10 mrem/y EDE level established by the NESHAP provides the protection of public health with an ample margin of safety required by the Act.

4.1.1.2 In Section VII.A.3 of the BID, it is difficult to determine the basis for the levels of emission control proposed for DOE facilities. The proposal notes that DOE is well within the present NESHAP limitation of 25 mrem/yr, produces essentially no risk, either to individuals or the public at large, and is reducing emissions further. Given these facts, it is difficult to identify any basis for a change in the current NESHAP limit to 10 mrem/yr under Approach A. Risks are certainly not known within a factor of 5, and there is essentially no risk difference between 10 and 25 mrem/yr.

Response: The assessment of the risks posed by DOE facilities indicates that doses are generally well below the limits established by the existing NESHAP. The change from 25 mrem/y whole body and 75 mrem/y critical organ to 10 mrem/y EDE reflects the changes that have occurred in health physics and radiation protection. EPA has been urged to change to the new unit of effective dose equivalent for some time. For most facilities, the change in the NESHAP is not a significant increase or decrease in the stringency of the older limits, but is essentially equivalent.

4.1.2 Dose and Risk Calculations and Analysis

4.1.2.1 The BID used emissions based on DOE's 1986 report of emissions and meteorological data taken from nearby weather stations. It is DOE's position that site specific methodology should be used when available. The EPA's use of site specific

data in conjunction with the less representative meteorological data from adjacent weather stations is a contributing factor in the technical errors in EPA's analysis of impacts from DOE's sites.

Response: The EPA uses site-specific meteorological data for DOE sites when such data can be obtained in the STAR format required by the assessment codes. Changes to the meteorological data between the draft and final EIS are documented in Appendix A of Volume II.

4.1.2.2 The principal release point for the Hanford facility is stated to be 61 m above the ground; however, a stack height of 10 m was assumed in the risk assessment. It is not possible to determine whether the assumed 10-m stack height for Reactive Metals, Inc. is appropriate It is difficult to believe that a good approximation of the Y-12 stack height could not be determined. How was the other information, such as which building is the major effluent source, the effluent filtration systems, etc., obtained? It is clear that the assumed flow rate of 200 cf. is an unrealistically low value. There are two values for U-234 in Table 2.5-1. Table 2.5-4 shows 6000 people with lifetime risks exceeding 1E-4, but Table 2.5-3 indicates that the maximum lifetime risk is 8E-5. The effectiveness of the proposed cleanup depends directly on the fraction that is tritiated water vapor; the basis for the statement that "much" of it is in that form is not given. The sum of the U-234 releases listed for individual Y-12 buildings disagrees with the value for the facility that is given in Table 2.5-1.

Response: The EPA is limited in its assessments to the data in the DOE reports. Discrepancies in the DEIS have been corrected based on these and other technical comments and information received during the comment period. The discussion of applicable control technologies and effectiveness is based upon analyses performed by PNL for the Agency during 1983-1984.

4.1.2.3 It is stated in Section 2.7 that releases are expected to be double the 1981 values. Examination of the previous BID shows that releases of U-234 and U-238 have both declined from 0.113 Ci/y in 1981 to 0.02 Ci/y in 1986. For some reason the doses did not decrease proportionately (88 mrem to the lung in 1981 to 19 mrem to the same tissue in 1986). The heading for the second column of Table 2.7-5 is inconsistent with the table title; the same dollar values are called "HEPA Filter Installation Cost" in Table 2.7-6. The first paragraph under Table 2.7-6 doesn't make sense. If the total costs equal AE costs plus all other costs and the AE costs are 25% of all other costs, then the total costs will be 5 times the AE costs.

Response: The discrepancies noted have been corrected in the FEIS. The fact that the risks estimated for this facility have not decreased exactly with the reduction in emissions is due to use of a slightly different location of the maximum individual and minor changes in the assessment codes.

4.1.2.4 It is not clear from the discussion on page 2-72 that the Ar-41 releases at Brookhaven were assessed using the BMRR stack height of 45 m (plus plume rise), or whether they were included with some other sources released at much lower levels (10-18 m).

Response: In the FEIS, the site was modeled using actual release heights.

4.1.2.5 Sixty-one percent of the dose from operation of the Battelle-Columbus facility is attributed to K-40. Many of the nuclides in Table 2.19-1 are naturally occurring. The fact that these nuclides were reported in effluent air samples doesn't mean that they are effluents due to facility operation.

Response: The Agency assumes radionuclides reported in the DOE's Effluent Information System are due to process releases.

4.1.2.6 The population around the Oak Ridge National Laboratory is given as 850,000; a better estimate of the population is 600,000 (p.2-8).

Response: The EPA's estimate is based on results obtained from the SECPOP computer code. Based upon the latitude and longitude provided for each facility, the code estimates the 0-80 km population using 1980 census data.

4.1.2.7 The new regulation is in terms of the effective dose equivalent, but only organ doses are calculated in the BID. The BID should estimate the effective dose equivalent so that these can be directly compared with the new regulation.

Response: As explained in the FEIS, the Agency bases its decision-making not on doses but on risks. The EDE is chosen for the NESHAPS limits to allow facilities to implement the standards using methodologies with which they are familiar.

4.1.2.8 A suggested rewrite of section 2.3.4 follows.

2.3.4 Supplementary Controls

2.3.4.1 LAMPF Main Stack

Air activation products from the LAMPF target cells and beam stop are exhausted through the main stack, which is located near the center of the experimental areas of the east end of the half-mile long linear accelerator. Total emissions as measured at the stack in 1988 were 121,000 Ci. Over 99% of this activity was from short-lived radionuclides; the main contributors were the 2-min half-life oxygen-15 (58%), 20.4-min carbon-11 (25%), and 10-min nitrogen-13 (13%). The only radionuclide that is longer-lived than carbon-11 was argon-41 (110 min), which contributed 0.4%. The maximum individual annual dose for a member of the public for 1988 from LAMPF emissions, as calculated by AIRDOS-EPA/RADRISK and using a 30% reduction for shielding by buildings, was approximately 9 mrem. However, long-range plans for LAMPF call for up to 40% increase in annual integrated beam current over 1988, so future maximum doses in the 10 to 15 mrem/year range are likely if no corrective action is taken.

Several potential methods for reducing the airborne radioactivity attributable to LAMPF operations have been considered. The large air flow to the LAMPF main stack (currently about 16,000 cu.ft./min) makes it very difficult to use any existing technology to remove the gaseous activation products from the air stream. The most realistic approach would be to provide significant holdup time to allow decay of the short-lived components before release. One favorable scheme would be to utilize a long duct of slowly moving air to provide an extended decay time. For example, an 8-ft diameter corrugated metal pipe that is 8000 ft long with a flow of 10,000 cu.ft./min would yield a transit time of 40 min. The (roughly) estimated construction cost of this air holdup system is $3,000,000 (FY-92 dollars) including connection of the existing exhaust system, suitable trenching and dirt shielding for the pipe, and a new stack at the end of the delay line. Table A.1 presents the reduction in radionuclides emissions as a function of holdup time for the major constituents.

Implementation of the 40-min air holdup will result in a reduction of the stack emissions by a factor of about 13, with carbon-11 as the main component remaining at about 0.26 of its original concentration (25%). An additional dose reduction for both employees and the public should be realized with this installation because the most sensible construction plan would be to extend the decay pipe eastward on the long narrow LAMPF mesa, resulting in a stack location that produces lower dose to the surrounding population.

Table 1. Effect of hold time of the release of principal air products from LAMPF.

Radionuclide	Half-Life (min)	Percent of Total Activity before holdup	Decay Factor 20-min Holdup	Decay Factor 40-min Holdup
Oxygen-15	2.0	58%	0.001	1E-6
Carbon-11	20.4	25%	0.51	0.26
Nitrogen-13	10.0	13%	0.25	0.06

Response: The FEIS reflects the emissions from DOE facilities for 1986, the last year for which complete data were available at the time that the analysis was made. If future activities at LASL will result in doses exceeding the limits established by the NESHAP, then additional controls and/or programmatic curtailments will have to be implemented to assure that the public receives the protection provided by the standards. The discussion of control technology provided by the commentor indicates feasible emission controls are available to the facility operator

4.1.2.9 The example dose/risk assessment for the Rocky Flats Plant contains numerous errors, beginning with the radionuclides and their activities that were used as the emissions source terms. These are not the nuclides nor the activities that were reported by the Rocky Flats Plant in its 1986 air emissions report. The distance to the nearest nearby individuals also is incorrect; the distance used is within the Plant boundary. If this assessment is to be used as the technical basis for the rule, significant revision is necessary.

Response: The assessment of the RFP was based on the emissions reported in the DOE's Effluent Information System. Attempts were made to resolve discrepancies between that data base and the individual facility's annual operating reports. However, time considerations did not allow full resolution of all such discrepancies. The estimated exposures and risks from the RFP were not critical to the decision making for this source category.

4.1.2.10 The proposed rule does not specifically state whether the 10 mrem per year effective dose equivalent limit is based on committed dose or annual dose. Although probably implicit in the AIRDOS/RADRISK calculation methodology, which is specified, we suggest that the basis needs to be explicitly stated in the rule, because it is a significant element with regard to radiation protection.

Response: The standard is for the committed dose that results from one year's emissions.

4.1.2.11 What are the errors associated with the measuring of radionuclides and flow rates at the control devices? How are these errors compensated for in the compliance demonstration? How many unmonitored points of emission exist at these facilities? What are the estimated emissions from these unmonitored points of emission? How do the measured radionuclide emissions compare to radionuclide losses based upon facility-wide mass balance calculations? The estimation of radionuclide emissions include the estimate of a control device efficiency factor. How reliable are these factors? What is the procedure used to verify these factors? Since control device efficiency tends to deteriorate over the lifetime of the equipment, how often are these factors re-assessed? Are the emission rate calculations based upon the most favorable, the most conservative, or an average efficiency factor?

Response: The EPA bases its risk assessment of DOE Facilities on the emissions reported by the individual sites to the DOE's Effluent Information System. The vast majority of the reported emissions are based on measured release rates. The implementation procedures for the NESHAP require the facilities to determine emissions based on approved monitoring, sampling, and analytical methods. The error associated with these measurements are relatively small. EPA belief, based on engineering studies and general knowledge concerning the release potential of emission points, is that unmonitored points of emission do not release significant amounts of radionuclides.

4.1.3 Control Technology

No Significant Comments.

4.1.4 Level of Proposed Standards

4.1.3.1 It is inappropriate and inconsistent with the guidance of radiation-protection organizations to state that the dose limits apply to any member of the public. Rather, the dose limits should apply to reference individuals in critical population groups.

Response: The standards apply to all members of the general public. However, the implementation procedures calculate doses based on "reference man".

4.1.5 Compliance and Implementation Procedures

4.1.5.1 EPA should delete the one-time reporting requirement in revising the standard, or, at least, exempt DOE sites that routinely operate at 20% of the standard or below.

Response: DOE facilities have already submitted their initial report. The rule only requires the submission of annual reports on operations.

4.1.5.2 The point of release in the annual reporting requirements should be the process areas at DOE facilities rather than the actual points of release since some larger facilities have multiple process areas with many separate release points.

Response: EPA does not object if all the release points of a single building are combined as one weighted average release point, provided that this is noted in the annual report.

4.1.5.3 The EPA should establish a threshold approach for annual reporting consistent with other source categories; we recommend a threshold for compliance reporting at 1 percent of the standard.

Response: EPA is requiring report from all DOE facilities that release radionuclides. The Agency believes that the limited number of DOE facilities make these reports practical and useful.

4.1.6 Costs of Compliance

4.1.6.1 Many of the estimates of cost are incomplete and are therefore underestimates. The level of detail provided varies greatly by source category. The principal reference regarding costs for Section 2 "(Mo86)" is not included in the reference list (there are, however, several references listed which are never called out in the text). The basis for deciding when to consider dose reduction alternatives varies from category to category. In Section 2, it is clearly related to effective dose equivalent levels; however, in other sections, there is no estimate of effective dose equivalent (or even of lung dose) and the criteria appear to be risk level or number of predicted deaths.

Response: EPA calculated the cost of controls for those DOE facilities with the highest estimated individual risks. Since doses and risks are correlated, using doses does not result in a different analysis than if risks levels are the selection criterion. Cost estimates were based on reliable information and only considered in making the ample margin of safety decision.

4.1.7 Other Comments

4.1.7.1 Environmental assessments, prepared by DOE for construction and operation of new radionuclide sources, should be reviewed by the EPA prior to issuance of NESHAP approval.

Response: DOE facilities will have to apply to EPA for approval to construct a new facility or modify an existing one in such a way that will result in increased emissions, as specified in the regulations of 40 CFR Part 61.

4.2. NRC-LICENSED AND NON-DOE FEDERAL FACILITIES

4.2.1 Basis for the Standards (legal/procedural issues)

4.2.1.1 Facilities which use limited amounts of sealed source devices for industrial purposes should be exempted from the proposed rule. Properly constructed and maintained sealed sources do not leak and, hence, do not emit radionuclides into the atmosphere.

Response: The EPA agrees, and facilities that only use or possess sealed sources are exempt.

4.2.1.2 The regulatory and record keeping burden imposed on facilities utilizing very small amounts of nuclear material would be excessive and is out of proportion when viewed in a holistic sense.

Response: The EPA has spent considerable time and resources to develop the tiered set of compliance procedures to minimize the burden on small users while still assuring that the public health and safety are protected. The Agency does not consider it to be an unreasonable or excessive burden to require facilities to account for the amount of material that they possess in the course of a year, especially since they already have procedures in place to assure that all such material is properly logged into and out of their facilities.

4.2.1.3 Clarification is needed as to whether or not the rule will apply to nuclear facilities operating under the Atomic Energy Act (AEA) of 1954. These are regulated by the NRC; the proposed regulations would be duplicative, unnecessary, and unlikely to produce any significant reduction in the already low levels of risk.

Response: The rule will apply to nuclear facilities operating under the AEA of 1954, as specified in the applicability provisions of the regulations. The CAA provides a different regulatory framework resulting in standards different than those promulgated under the AEA. These NESHAPS will provide a greater level of safety for the public for routine emissions of radionuclides.

4.2.1.4 Accidental releases should not be subject to the standard and may conflict with ongoing interagency efforts by EPA, FEMA, NRC, DOE, and other federal agencies to develop

guidance for accidental releases of radionuclides from federally owned or federally licensed nuclear facilities.

Response: Accidental releases are subject to the NESHAP, and can result in a violation of the standard. However, the procedures for implementing these NESHAPS do not involve specific measures directed at accident prevention. The risks and releases from accidents are not to be considered in granting approvals to construct or modify facilities. However, to the extent that non-routine emissions are to be expected from the operations at the facility they will be considered. EPA is not planning to develop any guidance for accidental releases which will conflict with other interagency efforts to develop guidance for accidental releases.

4.2.1.5 The EPA should limit the rulemaking on Subpart I to establishing an emission standard and rely on the NRC to enforce the standard under existing NRC regulations and requirements, since this proposed rule could render the U.S. uranium mining, milling, and fuel-fabrication industries less competitive nationally and internationally.

Response: EPA hopes to establish an Memorandum of Understanding (MOU) with NRC to reduce any duplicative requirements in the implementation of these standards, consistent with CAA Section 112.

4.2.1.6 NRC licensees should be allowed to take exception to the EPA guidance until such time that comparable NRC guidance is available.

Response: All regulated licensees will be required to follow EPA compliance procedures. EPA has received input from NRC in the development of the compliance guidance.

4.2.1.7 The NRC does not believe that it will have a sufficient basis to enforce the resulting standard for any of the approaches in this proposed rule under the current NRC-EPA Memorandum of Understanding since compliance with even the 10 mrem/yr dose limit cannot be validated by currently available measurement techniques.

Response: The implementation procedures do not require demonstration of compliance to be based on measurements. One of the reasons for the development of the COMPLY code is that environmental monitoring at the levels mandated by the NESHAPS is not always feasible.

4.2.1.8 There is a definite need for a State to have the ability to assume responsibility to locally administer the NESHAPS program; especially Agreement States.

Response: EPA will encourage the States to apply for delegation of authority to administer the radionuclide NESHAPS.

4.2.1.9 It is unclear whether the proposed rule is intended to cover releases of NARM from facilities licensed by NRC.

Response: The rule applies to all air emissions of radioactive materials released from facilities covered by the standard.

4.2.1.10 It should be stated in the subject Rule that if there is an inconsistency between the requirements or standards of the yet to be promulgated 40 CFR Part 191, Subpart B, regarding disposal, and those of the subject rule, emissions of radionuclides to the air resulting from spent fuel or high-level radioactive waste disposal shall not exceed those established for NRC-licensed facilities in Subpart I of the subject rule.

Response: There can be no inconsistency between 40 CFR Part 191, Subpart B and these NESHAPS since high level nuclear waste disposal operations are not covered by a NESHAP.

4.2.1.11 I-131 used for cancer therapy should be exempt from all regulation and compliance requirements within the scope of the proposed standard. Such an exemption could be justified on humanitarian grounds and substantiated with a benefit/risk analysis which clearly demonstrates the value of this activity in the preservation and extension of human life.

Response: The EPA disagrees, with the suggestion of an exemption. These standards will not prevent anyone from getting the I-131 therapy they need.

4.2.2 Dose and Risk Calculations and Analysis

4.2.2.1 Hospital stacks and vents are normally on top of the building and hospitals are typically multi-story buildings. The assumption of a 6- or 15-m release height has no basis in reality. Nearby individuals within 100 or 150 m will clearly be in the building's wake.

Response: The FEIS reflects changes in the assumed stack height for the generic assessment of hospitals.

4.2.2.2 The source term for the large hospital doesn't include I-131 or other nuclides that might be used for tests and research.

Response: The assessment in the FEIS has been changed to include I-131. The assumed source term is based on reported releases.

4.2.2.3 Section 3.3.2.2 states that "actual site data were used for the risk assessments" but the "stack heights used were all 15 m." Perhaps it is a remarkable coincidence. Tables 3-7 and 3-8 are not consistent; 2 E-4 is given as the maximum lifetime risk. Most of the dose from Facility D is due to noble gases; reducing the radioiodine dose by a factor of 100 would still leave an effective dose equivalent of about 7 mrem/y (for the assumed conditions).

Response: It is a coincidence that the stack heights were all 15 meters for the radiopharmaceutical manufacturers.

4.2.2.4 Table 3-19 is not consistent with Table 3-18; Facility C has calculated lifetime risks greater than 1E-4.

Response: The distributions of risk are based on extrapolations from typical facilities to the entire segment. Thus, there is some inconsistency in the levels of risks between these distributions and the estimates made for specific facilities evaluated due to their greater potential for causing significant risks. The FEIS has been amended to clarify the level of risk associated with each of the segments.

4.2.2.5 There are no tables of numbers of people exposed at various lifetime risk levels for fuel fabrication, source material licensees, incinerators, or shipyards/DOD reactors.

Response: The distributions are included in the FEIS.

4.2.2.6 Table 3-32 shows no risks above 1E-4 which is inconsistent with estimates presented previously and with the text on the same page (3-29).

Response: An asterisks (*) has been inserted in the risk distribution tables in the FEIS where there is insufficient information to precisely quantify the risk. In this case it is known that only a very few people are exposed to those risks.

4.2.2.7 The EPA should allow use of the COMPLY computer program as an alternative to determining compliance.

Response: The COMPLY code is approved for use by NRC-Licensed and Non-DOE Federal facilities.

4.2.2.8 Risk estimates are inappropriate due to failure to include relevant model parameters such as occupancy time, shelter, plume buoyancy, site-specific factors, especially those which apply to urban facilities.

Response: The EPA performs site-specific analyses when it is appropriate. However, for the NRC-Licensed source category the number of facilities makes this impractical. As for appropriate model parameters, the EPA's generic assessments are either based on facilities defined on the basis of typical sites or are actual (reference) facilities. The EPA assessments assume 100 percent occupancy time, and assume a buoyant or momentum driven plume rise, as appropriate.

4.2.2.9 It is unclear how or why the EPA would propose such concentration limits in light of the ongoing NRC effort to revise 10 CFR 20. We recommend that the EPA discontinue its efforts to promulgate this rule, but, failing that, that its implementation be synchronized with the NRC's efforts regarding 10 CFR 20.

Response: The EPA concentration limits are explicitly developed for the limits imposed by the NESHAP and the limiting conditions imposed on their use. They are in no way connected with, nor should they be confused with, the MPC's that the NRC has used and is revising in 10 CFR 20.

4.2.3 Control Technology

No Significant Comments.

4.2.4 Level of Proposed Standards

4.2.4.1 EPA has argued that the 10 millirem limit is actually less stringent than the 25/75/25 provisions of 40 CFR Part 190, but this is not necessarily true.

Response: EPA believes that for most situations the NESHAP is somewhat less stringent than the Uranium Fuel Cycle standard, but recognizes there are situations where this would not be the case.

4.2.4.2 It is not clear what the licensee must do if the radionuclides in use are not listed in Tables 1 and 2. The limit for MO-99 in Column 4 of Table 1 needs to be corrected.

Response: The tables now include more than 400 radioisotopes. If a facility has an isotope that is not listed, it should contact the EPA for assistance. The Mo-99 limit has been corrected.

4.2.5 Compliance and Implementation Procedures

4.2.5.1 Meeting this limit and its rules for implementation will require the Army to undertake extensive development of standing operating procedures (SOPs) to provide guidance to Army commanders. The proposed rule appears to lack sufficient, scientifically sound basis for such an effort.

Response: The EPA has prepared implementation guidance for the regulated community. There is no reason for the Army to undertake an extensive program to develop SOPs, but should simply use that guidance.

4.2.5.2 DOE recommends that EPA designate to the NRC the responsibility for implementing and enforcing compliance with radionuclide emission standards for NRC-licensed facilities. The NRC currently regulates radionuclide emissions under existing 10 CFR Parts 20 and 50 and implements the EPA's regulations for radionuclide emissions under 40 CFR Part 190 and Part 191, Subpart A.

Response: The EPA and the NRC are engaged in discussions to decide whether or not the NRC will enter into an MOU to implement the NESHAP.

4.2.5.3 NRC-licensed facilities should be afforded the same flexibility to use AIRDOS as is afforded to DOE facilities.

Response: AIRDOS is a much more difficult model for facilities to use and EPA is concerned that its widespread use would result in a large number of inaccurate reports. DOE facilities are allowed to use AIRDOS because they have been trained how to use AIRDOS correctly.

4.2.5.4 NRC-licensees should be allowed a suitable implementation period that will allow development of site specific models and procedures to demonstrate compliance.

Response: The development of the implementation models has already been completed by the Agency. Since the models were developed to require the minimum of site-specific information, there is no reason why additional time beyond that provided for by the Act is required.

4.2.5.5 Since the data required for demonstration of compliance with current NRC requirements will not be substantially changed, the current reporting methodology should be allowed to satisfy all regulatory reporting criteria (i.e., both NRC and EPA) until such time as a unified reporting and calculational format is developed.

Response: The NRC reporting requirements for licensees are not uniform. The EPA's reporting requirements have been developed to minimize the burden on licensees. The COMPLY code automatically generates the required report. In addition, NRC rules do not require compliance with a specific dose limit of 10 mrem/y to any member of the public and are, therefore, not applicable.

4.2.5.6 For sources with very small inventories, the owner or operator should be permitted to use process or source knowledge to demonstrate that potential releases are below the 0.1 percent continuous sampling level.

Response: EPA has developed a framework to allow facilities using small quantities of radionuclides to estimate emissions. These estimated emissions are then used to demonstrate compliance, either through the use of tables or the computer model COMPLY.

4.2.5.7 The proposed sampling and analysis plan is so different from the existing NRC radionuclide emissions reporting procedures that industry would be required to keep two sets of books. The monitoring plan proposed by the EPA conflicts with the NRC plan and would require major re-engineering of existing monitoring apparatus and substantial capital investment.

Response: Upon review of the NRC's requirements for monitoring and analysis at major fuel cycle facilities, the EPA has determined that these licensees can continue to use the monitoring plans specified in their license. For non-fuel cycle facilities, the compliance procedures specify calculational techniques that are believed to allow licensees to demonstrate compliance without changes to their facility or capital expenditures.

4.2.5.8 It is difficult, if not impossible, to predict the type and amounts of radionuclides that might be used in new medical facilities and universities.

Response: The standard does not require precise prediction but the reporting of past actions. However, some estimate of future uses can be made from prior history. These estimates should allow any facility to establish its own procedures to ensure compliance.

4.2.5.9 Problems were encountered with nuclide inventories, waste form, site configuration, and emissions in trying to evaluate the prescribed compliance procedures for low level waste sites. Many of the emissions are not point source releases, some possible nuclides are not listed even in compliance level 4, and the COMPLY code and instructions do not address area or volume sources or packaged wastes.

Response: While the COMPLY code does not explicitly account for area sources, such area sources can be assessed by assuming the release occurs at the center of the area. The radionuclides that may be assessed using COMPLY have been increased to over four hundred.

4.2.5.10 The principle shortcoming in regulating the doses listed in 54 FR 9612 comes in difficulty of measuring concentration levels as listed in Table 2, Appendix E. For some particular isotopes, the average natural background radiation in various parts of the country exceeds this limit. Demonstrating compliance would be difficult under the EPA's proposed limit.

Response: The EPA's implementation procedures do not call for environmental monitoring, in part because of the difficulties noted by the commentor.

4.2.5.11 The EPA must provide more flexible and more realistic methods for demonstrating compliance than are currently provided by the COMPLY computer code. Otherwise, it is likely that no mill can operate without major process or facility modification.

Response: The COMPLY code provides a realistic estimate of the annual dose to the maximally exposed individual. At level 4, the COMPLY program is complex enough to account for the conditions at a mill. No process changes should be required.

4.2.5.12 The EPA should develop guidance documents and training for the designated contacts to deal with computer problems and other problems such as emission estimates and area and volume sources.

Response: The EPA intends to provide training and implementation guidance for all agencies with compliance responsibilities.

4.2.6 Costs of Compliance

4.2.6.1 NRC licensees will be faced with increased paperwork and costs from dual NRC/EPA inspections and requirements for analyses and reporting, applications for facility modifications, and unfeasible or expensive sampling requirements.

Response: The EPA does not agrees that there will be a significant increased burden for licensees. EPA procedures have been designed to limit the burden to licensees. In addition, EPA hopes to establish a Memorandum of Understanding with NRC to further reduce any increase in burden to licensees.

4.2.6.2 Compliance with Approach D would be impractical and, if such a limit were imposed, the production of vital radioisotopes such as Mo-99, I-131, Xe-133, I-125, P-32 and others would have to be discontinued. Since 1 in 4 hospital patients in the United States have some nuclear diagnostic test performed with one or more of these isotopes, Approach D would have detrimental effects on the general health and welfare of the nation.

Response: The EPA has not promulgated the limits proposed under Approach D.

4.2.6.3 The EPA should balance the minimal risks associated with exposure to low levels of radiation with the risk of inhibiting technological advances in biomedical research.

Response: EPA does not believe that the standard will inhibit advances in biomedical research, since current operations comply with the standard.

4.2.7 Other Comments

4.2.7.1 The final rulemaking should clarify the status of low-level radioactive waste disposal facilities; the intent of the CAA and Subpart I would appear to focus more on operations and stored wastes than on properly closed disposal sites.

Response: Closed disposal sites are covered under the NESHAP.

4.2.7.2 The applicability of Subpart I to temporary work sites and outdoor work sites must be further evaluated; the standard applies only to licensed facilities.

Response: The standard applies to all NRC-licensees and includes all activities under the control of a licensee whether indoor or outdoor, permanent or temporary.

4.2.7.3 The annual possession worksheet may overestimate quantities onsite at any particular time since it does not account for quantities being shipped out; license possession limits may be a more realistic quantity for calculation of potential release. The concentration worksheet does not accumulate concentrations of the same nuclide from different stacks or vent; this will underestimate quantities released.

Response: Since the NESHAP imposed an annual dose standard, the relevant quantity is the amount of material handled in one year. The EPA recognizes that this is different than the NRC's possession limits. The possession limit is not a useful tool because it only limits the total amount of radioactive material the licensee can possess at any one time. Some facilities only use a small fraction of their possession limit, while others can use many times their possession limit during the year. The implementation system does not account for material that is shipped out, in those cases where the package has been opened. The system of release fractions is based on the amount of radionuclides that would escape when a larger quantity of material is used. If EPA was going to allow deductions for material shipped out then it would have to use a different, and higher, set of release fractions. The compliance procedures do account for the additive exposures from multiple release points.

4.2.7.4 EPA needs to consider the potential impact of the three proposed dose limits on the development of new low-level waste disposal sites. Having to demonstrate compliance with release limits of 3 millirem/year or 0.03 millirem/year could limit the viability of engineered alternative disposal methods now being considered by States.

Response: EPA has considered the effect of the standard on all licensees at the second, ample margin of safety step. The final result of the two step process is a standard of 10 mrem/y ede.

4.2.7.5 It is not clear whether the effluent discharge concentrations in Table 2 of Appendix E are applicable to releases from only one stack or whether they represent averaged or summed concentrations in those cases where the licensee maintains several such release points.

Response: The worksheets in the guidance document indicate that: (1) each nuclide released from the same stack or from different stacks must be summed; and (2) the same nuclide released from more than one stack should not be summed although the highest concentration from any stack should be used. This level of detail is not provided in Appendix E.

4.2.7.6 Will the NESHAP limits override the current MPC or proposed BAC limits of 10 CFR Part 20?.

Response: Only when they are more restrictive.

4.2.7.7 The proposed regulations inappropriately group NRC/Agreement State-regulated facilities in the same category. Modeling assumptions are based on the largest emitters, meaning that nuclear power plants, hospitals, and universities are all considered and treated equally. Hospitals, universities and most radiopharmaceutical firms emit far smaller amounts of a very limited inventory of radionuclides than do nuclear reactors. The EPA's claim in VII-B-1 that these facilities emit large numbers of radionuclides is not necessarily true.

Response: The EPA's assessment of the facilities that are licensed by the NRC show that the doses and risks received by the individuals at greatest risk are roughly comparable across many of the segments including power reactors, radiopharmaceutical manufacturers, and hospitals. Even though individual licensees may emit only a handful of radionuclides, as a group NRC-licensees do emit a large number of different radionuclides.

4.3 URANIUM FUEL CYCLE FACILITIES

4.3.1 Basis for the Standards (legal/procedural issues)

4.3.1.1 If any such new regulations are deemed necessary, before any new radiation standards are promulgated the EPA should implement the Memorandum of Understanding with the NRC to develop such a regulation on a joint basis, taking account of both the adequacy of the existing limits wherever possible and the need for consistency in methodology even where new standards are felt to be appropriate.

Response: EPA and NRC are currently discussing the possibility of creating a MOU which would help to reduce the regulatory burden on all NRC-licensees, including fuel cycle facilities. EPA hopes that these discussions can be brought to a successful conclusion. Unfortunately the court-ordered deadline for the promulgation of these rules did not allow enough time for these discussions to be completed. NRC has been actively involved in the development of the rulemaking. EPA has reviewed and approved current NRC sampling and analysis procedures for fuel cycle facilities.

4.3.2 Dose and Risk Calculations and Analysis

4.3.2.1 It isn't clear why the fuel fabrication facilities are not analyzed on a site-by-site basis. There are very few facilities compared to other source categories which are all analyzed on a plant-by-plant basis.

Response: Given the level of risk estimated for the fuel fabrication facility with the greatest potential for emissions and the limited time available to the Agency under the Court order, it was determined that site-by-site analysis of this segment of the fuel cycle was not needed.

4.3.2.2 It is not reasonable to analyze only one "representative" of 100 reactors. In addition, one has only to look at the GSDs for the release rates (Tables 4-23 and -24) to realize that there are problems with this assessment. Apparently no consideration was given to whether the reactor operated for a long or short period during the year, whether it was a new plant or an old one, etc. One of the features of AIRDOS is that many different radionuclides can be analyzed, so why were surrogates for radionuclides used? It isn't clear that the surrogate release values were chosen to be comparable on a dose equivalent basis. A reasonable sample of facilities should be analyzed on a site-by-site basis using a credible set of source terms. Onsite meteorological data are available at all the plants. In fact, analyses for the plants have already been performed and can very likely be found in the same reports used to construct Table 4-31.

Response: Given the time and resources available to the Agency, the decision was made to evaluate power reactors based on model reactors typifying facilities with emissions near the mean. Data reported by individual plants were used to estimate the upper bound of individual risks. In the way the model plants were defined, the operating history of the individual plants for that year were not relevant. Surrogates, chosen on the basis of the contribution to dose, were only used to define the emission rates for other radionuclides. Appendix A to Volume II shows the actual source terms that were run. Within the time and resource limitations, on-site meteorological data in a suitable format were not available to the Agency. Finally, while assessments of all plants have been made, and are indeed made annually by PNL, the assessment methodology and dose/risk factors are not consistent with those used by the EPA.

4.3.2.3 The maximum individual risk, which is slightly higher in the calculation than the EPA preferred value of 1×10^{-4} lifetime risk, is to a hypothetical maximum exposed individual, with many conservatisms included in the calculation, exposed to the effluent from a mill. Use of such a hypothetical worst case calculation to conclude that the real risk is high enough to warrant additional regulation for the whole UFC is not warranted.

Response: The level of the risks calculated for the facilities in the UFC source category are but one of the factors that influenced the Administrator's decision to promulgate a NESHAP. As noted previously, the Act provides important mechanisms that provide additional assurance that the public health will be protected from routine operational releases.

4.3.2.4 As currently written, the standard indicates that the EPA believes, and assumes, that a plant being regulated will operate right at the limit every moment of its operating life. This is an erroneous assumption.

Response: The EPA makes no such assumption. In fact, the Agency believes that most plants will operate as far below the limits as is practical.

4.3.2.5 Risk handling should consider risk/benefit trade-offs and the relative risks of alternatives to the risk-producing activity, including the costs and risks inherent in the termination of that activity.

Response: The EPA agrees these consideration are appropriate for the second step, determining ample margin of safety.

4.3.3 Control Technology

No Significant Comments.

4.3.4 Level of Proposed Standards

4.3.4.1 The NCRP concluded in September, 1987 that about one-tenth of one percent of the radiation dose to the average person in the United States results from the uranium fuel cycle. This is hardly an amount worthy of additional regulation especially given the fact that average natural background radiation levels vary by 100 mrem in a year across the U.S..

Response: EPA regulations under the Clean Air Act are designed to protect the maximally exposed person as well as the average person.

4.3.4.2 Use of the EPA methodology, because of its many conservatisms, effectively results in significantly lowering the standard limit.

Response: The EPA believes that its compliance procedures result in reasonable estimates of actual exposures.

4.3.5 Compliance and Implementation Procedures

4.3.5.1 Estimated doses to the maximum exposed individual off-site are routinely calculated by our facilities and reported to the NRC using a carefully developed system of sampling, analysis, and reporting. The NRC's system of inspecting and enforcing compliance is well developed. The data from our facilities produced in compliance with this rigorous methodology demonstrate that the emissions have represented and continue to represent an acceptable level of risk.

Response: The EPA has approved existing sampling and analytical methods for UFC facilities. However, since the NRC's calculational techniques are not uniform, and some are based on ICRP 2 methodology, the EPA has determined that doses must be calculating using its compliance procedures. EPA hopes that it and NRC will conduct negotiations to create an MOU to define the roles each will be responsible for in implementing the NESHAP for NRC-licensed facilities.

4.3.5.2 The proposed additions to 40 CFR Part 61 do not contain any provision to accommodate variances for unusual operations. It should recognize that temporary or unusual operating conditions may exist where standards could be exceeded for a short period of time and continuing operation may be in the public interest. Existing regulation allows such variances.

Response: The EPA limit is from exposure to total emissions over the course of a year. This should provide adequate operation flexibility.

4.3.5.3 The EPA's proposed reporting system would result in redundant and conflicting recordkeeping and reporting requirements.

Response: The EPA believes that its recordkeeping and reporting requirements are reasonable and do not impose an unreasonable burden on licensees.

4.3.5.4 Use of the prescribed simplistic COMPLY methodology for all plants is frequently inappropriate because of the extensive site-specific data employed in the current NRC mandated methodology. Demonstration of compliance should be allowed for nuclear power plants by employing existing NRC-approved methods. This existing methodology would more accurately represent the doses and risks to "real" people in the environment.

Response: As noted above, the EPA has prescribed the COMPLY methodology because the manner of calculating doses is not uniform under the existing NRC regulatory framework and in some cases relies on outdated ICRP 2 methodology.

4.3.5.5 EPA's proposed compliance procedures in this rulemaking reflect a total disregard of Section 122(c) of the Act and the EPA-NRC memorandum of understanding implementing that provision.

Response: The EPA disagrees, the compliance procedures have been developed with the input of the NRC.

4.3.5.6 Should a radionuclide NESHAPS for nuclear power plants be promulgated, the EPA should include provisions for a long implementation period.

Response: The EPA knows of no reason why power plants require a long implementation period. The compliance procedures have been developed and are extremely straightforward, and are ready for implementation 90 days after the effective date of the standard as required by Section 112.

4.3.5.7 Satisfying both NRC and EPA prescribed methods may be difficult, and perhaps impossible. It would be very difficult to monitor flow or sample for iodine being released from a pressurized water reactor vent, but continuous flow measurement and sample collection would be required by the current EPA proposal. Apparently any plan, other than continuous off-line sampling, would not be allowed by the proposed rules; if one wished to employ a different method, prior approval would be required. There is no basis given for this added requirement.

Response: The final rule permits the determination of releases using the monitoring provisions, calculational techniques, and analytical procedures incorporated in each fuel cycle facility's technical specifications.

4.3.5.8 Section 61.104 requires an annual report to include certain details regarding the facility which for our plants would be voluminous and unchanging. Such requirements are inappropriate for a large facility with unchanging process parameters, such as nuclear power plants.

Response: The EPA agrees that the report could be voluminous. However, the information requested is essential to enable the Agency to make a valid determination of whether or not the facilities are indeed complying with the standard. Given modern reproduction methods, facilities should be able to reproduce and submit this information on an annual basis.

4.3.5.9 Paragraph 61.107 should be changed such that an application under Paragraph 61.107 would not be required for construction of a new facility or modification of an existing facility if it has already been evaluated and accepted by the NRC.

Response: The EPA disagrees, EPA has a legal responsibility to ensure that the new facility will meet the requirements of its regulations; NRC approval is not designed to provide that assurance.

4.3.5.10 The 40 CFR Part 61 Proposed Rulemaking does not include any discussion of accidental release or associated limits/guidelines. If emissions during accident conditions are subject to this UFC NESHAP we recommend concise guidance be provided by the EPA as an integral part of any rulemaking. Associated EPA Protective Action Guidelines should be revised as necessary.

Response: Accidental releases are governed by the standard and can result in a violation of the standard. EPA intends to develop procedures to assist the regulated community in determining whether they are in compliance in accident conditions. EPA's Protective Action Guidelines will be reviewed to determine whether they should be revised to include discussion of radioactive NESHAP compliance.

4.3.6 Costs of Compliance

4.3.6.1 The EPA's proposed standards would waste industry and government resources demonstrating and evaluating compliance at facilities that are already subject to stringent standards and compliance requirements.

Response: These standards will provide additional protection to the public from the risks of radionuclides from routine releases without requiring the wasteful expenditure of time or money from the regulated community.

4.3.6.2 The estimated cost is greater than $1,000,000 per plant. This substantial sum of money will not reduce risk to the public and will not significantly improve effluent quantification.

Response: The estimate of $1,000,000 per plant is wholly unsubstantiated and the EPA is not aware of any costs associated with this NESHAP beyond some procedure modifications and the minimal time needed to determine compliance and prepare the required reports.

4.3.6.3 The EPA has not provided a valid cost-benefit analysis in the record.

Response: This level of these standards was not determined using cost/benefit analysis and no such analysis is required.

4.3.6.4 Stringent effluent limits could increase significantly the price of nuclear fuel as a result of increased costs in the UFC facilities which would also be required to install expensive equipment having no commensurate benefits. Thus, stringent effluent limits could lead to substantial increases in electric rates for equipment which does not substantially increase public health and safety.

Response: The EPA does not have any information to indicate that fuel fabricators will have to install additional effluent controls to comply with the NESHAP.

4.3.6.5 The dose limit of 3 mrem/yr may force other nuclear facilities throughout the nation to operate under load restrictions. A reduction in nuclear power generation could impact the nation's economy, and impede the nation's efforts to reduce chemical emission pollutants.

Response: The promulgated limit is 10 mrem/y EDE.

4.3.7 Other Comments

4.3.7.1 Making the citizen suit provisions of the Clean Air Act available will not provide a significant benefit. The industry has pervasive regulatory oversight. It is very difficult to imagine a situation where a plant would have a continued violation that could adversely affect public health and safety and then for the violation to continue after the NRC has been notified.

Response: NRC rules do not require that routine emissions be kept low enough to ensure that no member of the public receives a dose greater than 10 mrem/y ede. In addition NRC does not require its licensee to make such calculations as would be required to find out whether or not a facility provides this level of protection to the public. Therefore, it cannot be assumed that the NRC would prevent members of the public from receiving doses in excess of the acceptable level, of 10 mrem/y ede. In addition, EPA recognizes the Congress believes that provisions establishing the right of citizen suits do provide real additional protection to the public.

4.3.7.2 The EPA's analysis should consider the impacts of the alternative fuels which would substitute for the UFC; there is no discussion of increased CO_2 emission rates, the greenhouse effect or global warming.

Response: The EPA's analysis does not consider these effects as there is no information available to indicate that the promulgated rule will have an adverse impact on the generation of electricity by nuclear reactors, causing any increase in such effects.

4.4 HIGH LEVEL WASTE FACILITIES

4.4.1 Basis for the Standards (legal/procedural issues)

4.4.1.1 The EPA should not regulate air emissions from WIPP and MRS under the Clean Air Act. In the DEIS the EPA determined that the facilities that are covered under the High-Level Waste Disposal Facilities source category (i.e., the Waste Isolation Pilot Plant, High-Level Monitored Retrievable Storage (MRS) facility, and the Waste (HLW) repository) are designed with state-of-the-art effluent control systems enhanced by performance requirements of the waste forms and packages. The DEIS indicates that each of these facilities projects a lifetime cancer risk to individuals in the vicinity of less than 10^{-6}. However, the EPA proposed no NESHAPs only for HLW disposal. We believe it was the EPA's intent not to propose NESHAPs for the WIPP or an MRS facility, as well; however, the EPA did not specifically exclude WIPP and MRS from the proposed regulation. We request that the EPA clarify its statement not to propose NESHAPs for WIPP and MRS consistent with its position not to propose NESHAPs for HLW disposal.

Response: EPA is not setting a standard regulating air emissions from high-level waste disposal facilities.

4.4.2 Dose and Risk Calculations and Analysis

No Significant Comments.

4.4.3 Control Technology

No Significant Comments.

4.4.4 Level of Proposed Standards

4.4.4.1 In consideration of the factors and rationale that DOE has used in determining and recommending an acceptable or safe level, no further reduction below the safe level is required to provide an ample margin of safety.

Response: The Administrator has determined that the releases from the HLW Disposal source category do not require a NESHAP to assure the protection of the public health.

4.4.5 Compliance and Implementation Procedures

No Significant Comments.

4.4.6 Costs of Compliance

No Significant Comments.

4.5 ELEMENTAL PHOSPHOROUS FACILITIES

4.5.1 Basis for the Standards (legal/procedural issues)

4.5.1.1 We feel it is inappropriate to reduce levels of Po-210 emissions below the level of regulation finalized in the February 6, 1985, rulemaking.

Response: The Court decision under which this rulemaking has been conducted imposed a two-step methodology for determining the level of emissions that protect the public health with an ample margin of safety. The risk level that the Administrator has determined is acceptable requires limiting Po-210 emissions to less than the amount allowed under the previous NESHAP.

4.5.2 Dose and Risk Calculations and Analysis

4.5.2.1 The meteorological data used by the EPA in the assessment for Soda Springs is in error. The predominant wind direction is not out of the north blowing directly toward the Soda Springs population center, but rather out of the south/southeast and south/southwest blowing away from Soda Springs. This information, obtained from our onsite EPA-approved meteorological monitoring station, was provided to the EPA.

Response: The draft assessment used a data set from the on-site meteorological tower. Subsequent review indicated that the data set was invalid. The additional data provided by the plant was not in a form suitable for input to the assessment codes. Therefore, meteorological data from the nearest airport was used in the final assessment. Review of this data set indicates that the predominate wind directions closely approximate those reported by the plant.

4.5.2.2 The population in the 80-km radius of the Monsanto Soda Springs plant should be 75,000 rather than 100,000.

Response: The population cited is based on the results obtained from the SECPOP computer code which uses the 1980 census data.

4.5.2.3 EPA's assumptions of class Y solubility for the radionuclides and a sensitive lung mass of only 570 g have resulted in gross overestimates of dose. Also, EPA used the f1 factors of class D for Pb and class W for Po, thereby treating the Pb-210 and Po-210 as insoluble when applied to the lung dose and then treating them as soluble compounds when applied to the systemic dose. EPA cannot have it both ways. Also, ICRP recommends 1000 g for the lung mass rather than 570 g.

Response: EPA's use of Y solubility for radionuclides is based on solubility tests conducted on samples collected from calciner stacks at elemental phosphorus plants. The use of a 570 gram

lung mass is done because the estimate of risks is based only on the dose to the pulmonary region of the lung. Since almost all the risks from radionuclide emissions for elemental phosphorous plants is due to the radiation dose to the lung, the f1 factors used do not significantly affect the risk assessment.

4.5.2.4 The use of unreasonable default values by the EPA for environmental weathering, soil density, dairy and beef cattle populations and vegetable gardens is indefensible. Environmental weathering is usually represented with a 14-day half-life (the EPA used 35 years). The EPA chose a soil density of 220 kg/m^3 where 1,000 to 1,200 kg/m^3 would be more appropriate.

Response: EPA uses a 14 day half-life for the removal or weathering of radionuclides deposited on vegetation. The 35-year half life referred to in the comment applies only to the removal of radionuclides from soil. In addition, the EPA value for soil density is used for only top 15 cm of soil, for which such value is appropriate. Finally, none of the factors mentioned could significantly affect the risk assessment for elemental phosphorous plants since almost all the risk is from inhalation and exposure to the lung.

4.5.3 Control Technology

4.5.3.1 Calciner technology used at the various elemental phosphorus plants are different and must be considered individually. For example, the grate calciner at FMC typically has only 0.5% of the feed in the off gas while others can have as much as 25%. Also, the grate calciner generates up to 2.5 times as much off gas as a nodulizing kiln. Such process differences require much different design criteria when selecting appropriate control technology.

Response: The estimates of performance for venturi scrubbers and wet ESP systems are based on actual particle size distributions collected at the Monsanto and FMC facilities and do not assume that the distributions are normal or the same for both types of calciners. The SD/FF and HEPA filter systems are relatively insensitive to particle size. The performance estimates for these systems are conservative for the particle size distributions found for both types of calciners.

4.5.3.2 The information presented in the BID on control technology is based on assumptions which are not supportable. The stack data collected on FMC's calciners do not support the pressure drop vs. emission assumptions used in the BID.

Response: The relationship between pressure drop and venturi scrubber performance is well established in the industry and is used by most control device manufacturers in system design. Because the Po-210 is concentrated in the fine particle fraction

at FMC, the removal efficiency is quite low for pressure drops of 6.5 and 10 in. w.c. Consequently the difference in emissions from these systems is estimated to be quite small (less than 10 percent). The differences cannot be measured reliably because of inherent process variation and uncertainty in the sampling and analysis methods. Comparable emissions rates such as those found at FMC are expected given these uncertainties.

4.5.3.3 Using venturi scrubbers, the reduction in Po-210 emissions stated in Table 6-17 of the BID are not achievable at the stated pressure drop. At a cost of $7 million, FMC installed new venturi scrubbers on both calciners that were capable of a pressure drop of 10 inches w.c. Based on this data, the capital costs presented in Table 6-19 of the BID for venturi scrubbers appears to be low.

Response: The achievable reductions depend in part on the fraction of the radionuclides associated with the small particle sizes (see response to comment IV.5.3.4). The costing procedures used to develop the estimates presented in the BID are those outlined in the EAB cost manual. These procedures have been extensively used by the EPA to develop air control device costs for regulatory assessments and generally are adequate to provide reasonable costs with the ± 30 percent accuracy. The wet scrubber costs are based on standard manual estimates adjusted for high alloy construction. The cost estimates for venturi scrubbers compare reasonably well (10 to 40 percent difference) to costs of systems installed by the industry within the last 2 years. The EPA believes that the capital cost estimates used for the regulatory analysis are reasonable.

4.5.3.4 Of the four systems, HEPA filters would seem to be the least desirable. There is no data on the performance of HEPA filters on combustion systems or high-temperature furnaces. Installation downstream of a wet scrubber would appear to greatly shorten the life of disposable filters. This technology would have to be carefully examined before a system could be designed for consideration.

Response: HEPA filter systems were selected as one of the high-efficiency particulates control systems, although they have not been used on elemental phosphorus plants. However, they have been successfully used to control radionuclide emissions from uranium process plants and fine particulate emissions from high-volume air recycle streams at lead battery plants. Also, HEPA filters were selected because they provide a much greater level of control than is provided by the other control alternatives that were evaluated.

A major operating cost for HEPA filters is filter replacement, and cost estimates for HEPA filters include the costs of filter replacement and waste disposal. As a result, although the

capital costs for HEPA filters is the lowest of the four control technologies evaluated, the total annualized cost is higher than the other technologies.

4.5.3.5 Controls for Po-210 at elemental phosphorous plants may not provide adequate protection from the abnormally high Rn-222 emanation rate.

Response: Radon-222 releases were included in the source terms evaluated for these plants. The evaluation indicates that the radon-222 is not a major contributor to the total risk.

4.5.4 Level of Proposed Standards

4.5.4.1 The regulation of radionuclides from elemental phosphorus plants is not warranted.

Response: The EPA disagrees, its risk assessment demonstrates that current emissions do not result in an acceptable level of risk to public health and do not protect public health with an ample margin of safety.

4.5.4.2 In the February 6, 1985 rule-making, the EPA Administrator correctly established that the risks from radionuclide emission from elemental phosphorus plants are "very small" and the limit of 21 Ci/y of Po-210 from calciner stacks effectively limited emissions.

Response: During this reconsideration, the Administrator reexamined the risks from elemental phosphorous plants and has determined the conclusions in the February 6, 1985 rule-making were incorrect and that 21 Ci/y does not provide the level of safety with an ample margin required by the law and the Court's guidance on determining the appropriate levels.

4.5.4.3 The Fort Hall Reservation is highly exposed to, and affected by, radionuclide emissions from elemental phosphorus plants. Thus, we urge EPA to adopt the emission standard of 0.6 Ci/y of Po-210 proposed in Approach C which would provide ample health risk protection and also represents the application of the best available control technology of a high energy scrubber which has proven to greatly reduce Po-210 emissions. We feel that Approaches A and B do not provide the surrounding community with an ample margin of safety required to protect the public health and therefore would not be in keeping with the intent of the district court remand decision or Section 112 of the Clear Air Act.

Response: The Administrator has determined that a NESPAP limit of 2 Ci/y will assure the protection of public health with an ample margin of safety.

4.5.5 Compliance and Implementation Procedures

No Significant Comments.

4.5.6 Compliance Costs

4.5.6.1 Information is not presented on the ability of a wet ESP or a spray dryer/fabric filter to remove less than 0.5 um Po-210 particulates. Therefore, pilot work would be required. FMC estimates installed costs of $40 - 80 million for the wet ESP's, much higher than presented in Table 6-19 of the BID, and $25 - 50 million for the spray dryer/fabric filter system.

Response: The fractional efficiency for the wet ESPs are based on 1) data from measurements of a wet ESP system applied to a calciner at an elemental phosphorus plant that included particle sizes below 0.5 micrometers, and 2) accepted design calculations. These fractional efficiency estimates did account for removal of particles less than 0.5 micrometers in size. In general, fabric filtration technologies have been found to be insensitive to inlet particulate matter loading and particle size distribution as long as properties of the inlet particulate matter allow good cake formation on the bags. Past experience with the SD/FF system with the lime slurry on similar process streams have shown this system to be particularly insensitive to the particle size distribution in the exhaust gas streams. These systems have demonstrated the ability to remove volatile metals such as arsenic from combustion source and metallurgical process exhaust gasses at greater than 99 percent efficiency. The EPA believes that the estimates of 99+ percent removal used for the analysis are reasonable.

4.5.7 Other Comments

4.5.7.1 There is no indication that EPA used any of the ambient monitoring data from the Southeast Idaho Radiation Exposure Study to verify the AIRDOS dispersion model predictions. The EPA's Proposed Guidelines for Exposure Assessment (49FR46304) states, "When the estimates of environmental concentrations are based on mathematical models, the model results should be compared to available monitoring data, and any significant discrepancies should be discussed. Reliable, analytically determined values should be given precedence over estimated values whenever significant discrepancies are found. The monitoring data from the study indicate that the Soda Springs area currently has essentially background levels of Po-210 in the ambient air.

Response: EPA did review and evaluate data from the Southeast Idaho Radiation Exposure Study in developing standards for elemental phosphorous plants.

4.5.7.2 The EPA did not adhere to the stack test methods for point source particulates as described in Method 5 (40CFR60) when obtaining a sample for radionuclide analysis. Dilute nitric acid was used as a rinse of the probe after the acetone, and nitric acid was also used in the impinger solutions instead of a specified grade of water. The approved method states that no modifications shall be made without the Administrator's approval.

Response: The slight modifications to Method 111 were made to assure complete recovery of the polonium-210 and to provide a more accurate measure of polonium-210 emissions.

4.5.7.3 The particle size characterization of emissions is inadequate for exposure assessment purposes. The basic problem is that the measurement technique used could not accommodate the particle size distribution encountered. The 0.3 um diameter assumed in the EPA assessment was obtained by an extrapolation beyond measured data. Thus, the 0.3 um diameter is suspect and we feel it could easily be 0.2 um or less.

Response: Differences in particle size between 0.3 and 0.2 micrometers would have only a small impact on the estimated risks.

4.5.7.4 We ask you to waive the emission testing requirements for both Occidental Chemical Company's elemental phosphorus units at Columbia, TN based upon favorable emission test results. Furthermore, if the waiver of emission testing is granted, we assume that the requirement to install a device for measuring the phosphate rock feed to the kiln during service testing is also waived.

Response: The new rule no longer allows for waivers from testing.

4.6 COAL-FIRED UTILITY AND INDUSTRIAL BOILERS

4.6.1 Basis for the Standards (legal/procedural issues)

4.6.1.1 Regulation of coal-fired boilers under the Approach D alternative is unwarranted. Regulation of any radionuclide source category under Approach D is unrealistic and unjustified because of the conservative assumptions in this approach and because the releases fall well below those considered to be an acceptable risk to the public. Approaches A, B, and C were determined not to warrant regulations of radionuclide emissions from coal-fired boilers, even at the ample margin of safety decision.

Response: The EPA has not promulgated a NESHAP for coal-fired boilers.

4.6.1.2 Emissions from coal-fired boilers are presently regulated under the National Ambient Air Quality Standards (NAAQS) for particulate matter. In addition, the new larger coal-fired boilers have to meet NSPS requirements for other pollutants such as particulate, sulfur dioxide, and other hazardous pollutants.

Response: The EPA is aware of the existing regulations that apply to coal-fired boilers, their existence was considered in determining that standards would not be issued.

4.6.1.3 If the Agency intends to follow a two-step decision-making approach, and therefore make a "best estimate" of risk as part of the initial step, it must also reduce conservatism in the following areas: (1) average U-238 concentration in fly ash, (2) stack height and temperature profiles, (3) food transfer factors, and (4) the linear, non-threshold dose response model.

Response: The value for uranium in fly ash is based on the geometric mean value of uranium in coals and enrichment factors based on monitoring data. The stack heights and temperature profiles used are also based on the actual plant parameters. The basis of the linear no-threshold dose response assumption and the food transfer factors are discussed extensively in Volume I of the FEIS.

4.6.2 Dose and Risk Calculations and Analysis

4.6.2.1 What is the meaning of the enrichment factor for the two radon nuclides in fly ash? Does it mean that the radon wasn't released during combustion? The post-combustion concentration of radon in fly ash is 20 times greater than the original concentration in the coal.

Response: The enrichment of radon in the fly ash would be more accurately stated as the enrichment of radon in the effluent off-gas. The factor of 20 is based on the EPA's monitoring results.

4.6.2.2 While it is clearly not reasonable to expect the Agency to perform site by site evaluations of 1200 coal-fired power plants, the extrapolation from four facilities to 1200 seems to be inadequate. This may be due to the fact that the extrapolation procedure is not described explicitly. Similarly, the extrapolation for the industrial boilers is even greater and involves more uncertainty. It would be more appropriate to take a larger representative sample of both categories of boilers and to use those results to estimate the country wide impact of those facilities.

Response: The methodology employed to extrapolate risks from "representative" utility plants and a single large industrial boiler was chosen based on the time and resource restraints imposed on the Agency by the Court order. The EPA believes that these estimates are accurate enough for decision-making purposes, and doubts that evaluation of even a larger fraction of facilities would result in a significant change in the estimate.

4.6.2.3 Other assessments of this question have been performed. The results of the EPA assessment should be compared to those and the differences between the results should be discussed and rationalized.

Response: The assessment has been compared with other evaluations, notably those performed by OAQPS. Reasons for the differences in the estimated risks have been identified. These include differing methodologies for determining locations of nearby individuals, differences in accounting for total uranium releases, and differences in the versions of the assessment codes used.

4.6.2.4 Apportioning radionuclide emissions based on the number of boilers fails to account for, among other things, units with different capacities and units with different levels of particulate control technology; radionuclide emissions can be apportioned more accurately based on annual particulate emissions.

Response: Use of plants with typical particulate emissions in the assessment obviates the need for explicitly accounting for differences in capacities and particulate control technology. The extrapolation method allows for the accounting in demographic variations, and these can be at least as important as the other factors mentioned.

4.6.2.5 The EPA assumes a population of 17.2 million residing within a radium of 80 kilometers; yet only two coal-fired power plants in the U.S. have a surrounding population in excess of 10 million.

Response: The reference plants evaluated were chosen to reflect typical and extreme emissions characteristics for plants located in urban, suburban, rural, and remote locations. Since the risks in terms of deaths/y were calculated for each location segment separately and normalized to the total population of the United States, the choice of a plant with a very large surrounding population does not greatly effect the estimate.

4.6.2.6 The very fact that existing electric utility generating facilities are being and will continue to be replaced by new electric utility generating facilities which must meet 40 CFR Part 60 Subpart D(a) anyway, means that the risk of death due to radionuclide emissions from coal-fired boilers will drop irrespective of 40 CFR Part 61 Subpart U. By forcing retrofits on older boilers, thus requiring them to operate longer in order to retrieve the retrofitting costs, it will stymie their replacement.

Response: The EPA acknowledges that emissions are unlikely to increase given the NSPS. This is one factor considered in the decision not to promulgate a NESHAP for this source category.

4.6.2.7 The EPA's estimates are based on numerous conservative assumptions, for example, 1) individuals reside in the predominant wind direction at a distance of 750 meters from the plant, 2) a large fraction of the foodstuffs consumed by the individual are grown at that location, 3) individuals reside at a single location for 70 years at the point of maximum exposure. Given these many conservatisms, EPA's risk estimates can easily be an order of magnitude or more higher than more realistic assessments.

Response: The EPA does not consider these assumptions necessarily "conservative" in using reference plants to assess the risks for source categories where the number of facilities make site-by-site assessment impractical. With upwards of 55,000 coal-fired boilers and their location in both rural and urban areas it is likely that there are individuals residing in the predominate wind direction, that some individuals do obtain a considerable fraction of their food locally, and that there are individuals who reside in the locations of maximum environmental concentration for their entire lives.

4.6.3 Control Technology

No Significant Comments.

4.6.4 Level of Proposed Standards

No significant comments

4.6.5 Compliance and Implementation Procedures

4.6.5.1 The EPA is proposing to mandate a legal impossibility by requiring the installation the needed retrofit equipment required for compliance in a two year time span.

Response: No NESHAP is promulgated for this source category.

4.6.6 Costs of Compliance

4.6.6.1 Most coal-fired boiler owners would have to spend a considerable amount of money to replace control equipment in order to achieve the proposed emission standard. The radionuclide reduction achieved in lower particulate emission rates would not justify the considerable expense that would be incurred. Public utilities in particular indicated that they would have to retrofit fossil fuel plants to a baghouse technology for particulate/radio-nuclide control or install electrostatic precipitators.

Response: No NESHAP is promulgated for coal-fired boilers.

4.7 INACTIVE AND LICENSED URANIUM MILL TAILINGS

It is expeditious and seems reasonable to combine the response to comments for these two source categories because: 1) most commentors provided comments on both active and inactive mill tailings piles; 2) comments often pertained to both categories of tailings piles; 3) the piles are similar in many respects; and 4) both categories of piles are included within one industry.

4.7.1 Basis for the Standards (legal/procedural issues)

4.7.1.1 The change from a design standard to a performance standard is inconsistent with the codified rules and was rejected by both the EPA and the NRC when the UMTRCA rules were promulgated.

Response: The final NESHAP for disposal is an emission standard, as required by the Clean Air Act.

4.7.1.2 There is no justification as to why the Clean Air Act standard requires a synthetic liner under the tailings ponds.

Response: The requirement for a synthetic liner comes from the UMTRCA rulemaking. Since the requirements of UMTRCA must be met for future impoundments, this approach is reasonable. In addition, EPA has a responsibility to make sure that the rules it promulgates under one statute do not result in unnecessary transfer of pollution into another medium, in this case groundwater.

4.7.2 Dose and Risk Calculations and Analysis

4.7.2.1 Radon concentration and risk should be directly proportional to the source term. However, while the source term at the Bluewater mill increased by 1.3 (28.3 to 37.4 KCi/y) the radon concentration at the nearest residence increased by a factor of 1.8 (1.8 to 3.3 pCi/L). These discrepancies should be resolved before the final rule-making.

Response: The assessment in the FEIS has been amended to reflect the new or revised information obtained and developed since the DEIS was published. The EPA appreciates the efforts of the industry and DOE to provide additional information. Where the validity of the information could be confirmed, it has been incorporated into the FEIS. For example, the FEIS has been revised to reflect the anticipated relocation of piles.

4.7.2.2 The relationship, 1 pCi/m^2-s of radon per pCi/g of Ra-226, is inaccurate, varies by an order of magnitude, and results in an overestimate of the flux. Flux from mill tailings piles should be based on flux measurements.

Response: The EPA recognizes that the 1 to 1 radium to radon correlation is an approximation. However, there is no scientific consensus on what the value should be. EPA believes that this is a reasonable estimate for situations where mill-specific data are unavailable.

4.7.2.3 The assessment was performed at the Panna Maria tailings pile assuming that all tailings were dry and exposed, while much of the tailings pond is covered by one foot of a water deposited clay.

Response: The assessment in the FEIS reflects the information provided by the commentor. EPA has determined that the evaluation of all dry conditions contained in the draft EIS does not provide, given the disposal activities under UMTRCA, a particularly realistic estimate of future exposures and risks.

4.7.2.4 The height of the Panna Maria tailings dam is 15 m, not the 1 m assumed in the assessment.

Response: The 1 meter release height is appropriate for estimating emissions from a volume source.

4.7.2.5 The EPA has grossly overestimated radon emissions by assuming that the radium is evenly distributed throughout the tailings pile.

Response: Lacking mill-specific data, the EPA assumed the even distribution of radium throughout the tailings. This assumption only affects that estimate of the source term during operating and standby periods. For the disposal period, the assumption of uniformity is roughly correct since the entire pile will be drying and exposed. The assumption is irrelevant to the estimation of the post-disposal source terms.

4.7.2.6 The heading on the table indicating required cover depth in meters appears to be incorrect. It should indicate depth in feet. The DOE requests further information regarding the calculational methodology used to construct this table. For example, was RAECOM used to project cover thicknesses?

Response: The column heading is correct. The depths of cover were calculated using the methodology set forth in Appendix B of the EIS. The RAECOM model was not used to project needed depth of cover. Depending on local conditions, the absolute cover depths for any individual pile may be over- or under-estimated. However, the EPA feels that the aggregate costs are sufficiently accurate for decision making.

4.7.3 Control Technology

4.7.3.1 The EPA has not derived the tailings pond size limit based on a thorough study of the emissions, but instead the 40-acre size seems quite arbitrary.

Response: The 40-acre limit was chosen to reflect best current practice, as exemplified by the Sweetwater impoundment.

4.7.3.2 Studies at the Shirley Basin site indicate much greater reduction in radon emissions vs. soil cover thickness than estimated by EPA in Table 9.12 of the BID. For example, 1.5 m of random fill reduced the radon emanation to levels indistinguishable from background (about 1 pCi/m^2-s). Thus, it appears that EPA's cover thickness calculations are grossly in error.

Response: In assessing the costs of various alternative disposal fluxes the absolute depths of cover and costs are not as important as the incremental changes. As stated in the FEIS, the depths of cover for all sites are based on the assumption of sandy soil and other parameters such as moisture content set forth in Appendix B. Facilities with access to clay soils will be able to meet the disposal flux requirements using thinner covers than estimated. Also as required under the UMTRCA rules, the cover must be designed to meet the flux limit for 1,000 years.

4.7.3.3 Continuous disposal of mill tailings has not been used by the uranium industry; it would present serious operational problems and excessive costs. Immediate disposal of tailings under the continuous disposal method may not always be practical given the limited construction seasons and the size of the impoundments.

Response: The Agency is aware that continuous disposal has not been used at existing mills. However, it believes that the technology is applicable, as demonstrated by its proposed use at the San Miguel mill that was licensed but not constructed. This lack of practical experience is part of the reason why mill owners can choose between continuous and phased disposal.

4.7.4 Level of Proposed Standard

4.7.4.1 The proposed EPA radionuclide NESHAPS will cause the closure of the domestic uranium milling industry. The shut down of the mills would cause strict reliance on foreign-source uranium which could be devastating to our energy and defense independence. In addition, the dismantling of the industry will violate Congressional findings in the Atomic Energy Act that a viable uranium industry is essential to our national security,

result in a further reliance on fossil fuels which create significant health hazards by their use, result in further loss of employment to industry workers and workers in service industries related to the producing industry, and create more social and economic upheaval in the mining communities that have already suffered greatly from the industries' demise.

Response: The NESHAPS will not result in the closure of the domestic uranium milling industry. The uranium industry is not economically viable due to large uranium inventories, a non-increasing demand for uranium, and the ability of foreign suppliers to produce uranium at lower cost. Recognizing these facts, the Administrator is required by the Act to establish NESHAPS that protect the public health without considering the possible closure of the plants in the affected industry. Closure considerations may only be addressed in the second step of the process when the ample margin of safety is determined.

4.7.4.2 The EPA has failed to demonstrate that there is a significant risk due to radionuclide emissions from uranium mill tailings piles. Many industries posing greater risks are ignored, e.g. soil tillage, water supplies, building materials, natural gas and background.

Response: EPA risk assessment demonstrates the significance of the risks presented by uranium mill tailings piles. The EPA's on-going programs will determine whether or not regulation of other activities, including those mentioned by the commentor, require regulation.

4.7.4.3 The public health is protected from radon emissions from uranium mill tailings piles with an ample margin of safety under the existing regulatory requirements of UMTRCA. New EPA regulatory requirements under the Clean Air Act are duplicative, unnecessary, and would serve no useful purpose. The UMTRCA standard has not been shown to be unsatisfactory.

Response: The Administrator has determined not to defer to other regulatory authorities. The NESHAP for tailings disposal establishes both a time frame for disposal, citizen suit provisions and monitoring requirements that are not provided by UMTRCA.

4.7.4.4 The most stringent of the proposed standards is unrealistic because the soil used to cover the pile would exceed the limit of 0.02 pCi/m^2-s. The background flux in the area is about 0.5 pCi/m^2-s In addition the proposed standards of 6 pCi/m^2-s to 0.02 pCi/m^2-s for disposal of uranium mill tailings are not enforceable because the natural variability is greater than the proposed standard, thus rendering the model for predicting compliance unreliable.

Response: The final NESHAPS establishes a design flux through the cover of 20 pCi/m^2-s.

4.7.4.5 There is no need for a new standard since EPA has not demonstrated that 0.12 fatal cancers per year that would result from the current radon emission standard is not a acceptable risk.

Response: The fatal cancers per year is just one of the risk indicators that the Administrator considers. Individual lifetime fatal cancer risks must also be found to be acceptable with an ample margin of safety.

4.7.4.6 A standard of 2 pCi/m2 is both feasible and reasonably achieved. The EDF believes that the standard must be set at 2 pCi/m^2-s even under Approach A because of the requirements to establish an ample margin of safety based on "feasible" technologies capable of diminishing the risk.

Response: EPA selected an emission limit of 20 pCi/m^2-s as the NESHAP since it protects public health with an ample margin of safety. The lower limit of 6 pCi/m^2-s was considered for the standard but was not selected because it would result in little reduction of either individual risk or population effects when compared to the relatively large costs of implementation.

4.7.5 Compliance and Implementation Procedures

4.7.5.1 The proposed standard is not written as an average, but as an instantaneous rate. This is patently unfair and punitive. The standard may be exceeded for short periods of time during severe climatic conditions, while the annual average may be an order of magnitude less than the standard allows. This forces the cover to be designed for the most severe conditions.

Response: The final NESHAP establishes a long-term average flux. Monitoring is required to provide assurance that the installed cover meets the emission limit. The EPA's experience with radon flux measurements establishes the fact that the average obtained from a single monitoring period is sufficient to account for variations over time when the number of samples approaches 100.

4.7.5.2 If promulgated, the requirement for covering mill tailings to reduce releases of radon would in fact create a greater risk for the workers from accidents than the risk radon emissions are believed to pose for the general public.

Response: While covering the piles might result in risks to the workers, the DOE's experience with disposal under the UMTRCA standard has been that accidents are experienced far less

frequently than estimated. Further, while there will be some construction related risks, the benefits of covering the piles will be accrued over time periods of 1,000 years or longer.

4.7.5.3 Several troubling aspects of this regulation are (1) how is the term "cease to be operational" defined, and (2) what action will the EPA take if an operator reports noncompliance.

Response: The definition of operational has been clarified in the final rule. The EPA will, as required by the Act, take appropriate enforcement action in the case of non-compliance.

4.7.5.4 The EPA should recognize and accept alternative work practices which are capable of meeting the standards.

Response: The work practices for operating and standby impoundments are based on what the Agency believes are least-cost alternatives.

4.7.5.5 The limitations of Method 115 are unduly restrictive and skew the results to periods of high emanation rates rather than indicating average rates.

Response: Monitoring radon flux during or immediately after periods of rainfall or during periods of freezing temperatures are known to produce unreliable estimates of the average emission rate. Furthermore, an operator may select a multi-period measurement approach to demonstrate compliance.

4.7.5.6 Consideration must be given to the fact that some tailings piles have already been stabilized; there will be substantial health, safety and environmental costs if these have to be modified.

Response: The Administrator did consider the fact that some piles have been stabilized in determining the ample margin of safety in the final rule.

4.7.5.7 Flexibility must be built into any of the proposed regulations: 2 years is a very short time for the design, review and approval by agencies, and construction of new impoundments required under Approaches A and B; mills not already meeting the new technology under C would have to shut down; under Approach D, time would be required to develop new technology for tailings disposal.

Response: The final NESHAPS for operating and standby periods are believed to give operators sufficient time to plan and gain regulatory approval of future impoundments. The two year limit for completing disposal of tailings at inactive and inoperable mills is compelled by the Act and is not within the Administrator's discretion to change or negate.

4.7.6 Compliance Costs

4.7.6.1 The EPA estimates that the proposed regulations would cost up to $37 million additional capital costs for operating mill tailings piles and $200 to $300 million additional capital costs for the disposal of uranium mill tailings. The EPA fails to include the cost of reclamation of the 12 piles it classifies as active. Imposing these capital costs on this industry could serve to close down an industry that the Congress has stated is vital to the national security.

Response: The FEIS shows the appropriate capital costs for disposal of all piles, work practices at all operable impoundments, and single cell, phased, and continuous disposal technologies at future impoundments. These costs including reclamation were included in the DEIS as well.

4.7.6.2 Compliance costs would have the effect of shutting down the uranium milling industry which would be an adverse effect requiring the EPA to deem the proposed regulations to be a "major rule".

Response: The EPA disagrees that the final rules will serve to shut down the industry. The compliance costs for the NESHAP will only slightly increase costs over the already existing regulations.

4.7.6.3 Given the small incremental reduction in health risks associated with the EPA's regulatory requirements for existing piles and the critical state of the uranium production industry, the costs are too high.

Response: The EPA estimates that the NESHAP for operating and standby mills will have a total annual cost of approximately $1.25 million. The Administrator found these costs to be reasonable in the second step of the rulemaking process.

4.7.6.4 The DOE, which has experience in stabilizing tailings piles, has testified that the costs to stabilize existing tailings piles may be on the order of $1-2 billion.

Response: The DOE's cost estimates include monies for research activities, technology development, and community participation. These costs will be incurred by DOE regardless of the standard promulgated by the Agency. The EPA's estimates, as noted above, are for disposal only, and are based on a single soil type and assumed moisture content. Thus, while the explicit costs for a given mill might be over- or under-estimated, the EPA believes that the aggregate costs are reasonably accurate and provide sufficient basis for decision making.

4.7.6.5 EPA does not address the question of long term funding for testing, reporting, and possible remediation of the piles after closure.

Response: The final rule requires one-time monitoring to establish compliance with the design flux, thus there are no long-term monitoring and reporting costs. If additional remediation is required, based on test results, the EPA expects that the costs will be borne by the responsible firms, in the case of Title II sites, and by DOE and the states in the case of Title I sites.

4.7.7 Other Comments

4.7.7.1 The EPA's basic research into and comprehension of fundamental issues in uranium milling appear inadequate. The EPA gives a confusing and incomplete account of the milling process for uranium ore.

Response: The EPA disagrees. The process description referred to is merely a summary of the extensive descriptions that have been published by the Agency and the NRC.

4.7.7.2 If the proposed regulations are promulgated without modification, the uranium industry will require the exemption provided in Section 112 (c)(2) of the CAA.

Response: The EPA does not believe that the effect of the standard would require such action. However, application for an exemption is available to such facilities who determine that they cannot meet the requirements of the NESHAP.

4.7.7.3 The survey of the U.S. uranium industry is incomplete; many major operators are omitted.

Response: The Agency believes that it has identified and listed all licensed and inactive tailing impoundments that have resulted from the recovery of uranium by conventional acid- and alkaline-leach methods.

4.7.7.4 If the uranium mills are unable to operate, this will effectively end domestic uranium production. Both underground and surface uranium mining are dependent on mills to process their ore.

Response: The EPA agrees that if all mills close that mines will not be able to find domestic sources of milling. However the minimal costs associated with the NESHAP for operating and standby mills should not force closure of the industry.

4.8 DOE RADON SITES

4.8.1 Basis for the Standards (legal/procedural issues)

4.8.1.1 A DOE memorandum indicates that the EPA may have chosen not to regulate DOE radon emissions in its previous rulemaking due to its belief that the silos at Fernald (FMPC) were not vented. However, the constant seepage of radon from the silo cracks and the purposeful 1986 venting of radon demonstrate the necessity of such regulation.

Response: The final rules establish a NESHAP for DOE Radon sites including FMPC.

4.8.2 Dose and Risk Calculations and Analysis

4.8.2.1 The EPA should look at the combined health impact caused by radon and uranium from the FMPC. The level of control should result in an estimated risk no greater than the risk tolerated in the 1983 proposed rulemaking.

Response: The final NESHAPS for DOE Facilities and DOE Radon Sites establish limits to assure protection of public health with an ample margin of safety. The two standards cannot be properly compared or combined. The DOE Radon standard covers the disposal of waste material, the DOE facilities standard covers emission from operational emissions. While the disposal standard is designed as a limit to be used by DOE in its CERCLA cleanup of a waste problem, the other standard is designed around monitoring of operation and annual reporting. Any attempt to combine the two would cause confusion in implementing standards applicable to disposal for operations and visa versa.

4.8.2.2 The radon emissions from the K-65 silos at the FMPC in Fernald have not been routinely measured. How were these emissions estimated given the deteriorated state of the containment and the variation of emissions due to the heating of the silos? How were accidental releases included in the emission estimates? What other radon emissions occur at the FMPC site? Have radon emissions been estimated from radioactive materials deposited in the soil within the confines of the DOE facilities?

Response: The emissions from the K-65 silos were estimated, as discussed in Chapter 10 of Volume 2 of the FEIS, on the basis of the Ra-226 content, the area of the silos, and theoretical equations for diffusion through concrete. The Agency is aware that its estimate is only a rough approximation. The EPA is not aware of any other major radon sources at the FMPC site.

4.8.3 Control Technology

No Significant Comments

4.8.4 Level of Proposed Standard

4.8.4.1 The radon emissions rules are expressed in curies released per unit area per unit time. These units are adequate for mill tailings but not for manufacturing or experimental work that involves uranium, thorium or radium. Dose limits such as those employed in the DOE operations rules should be used, if EPA intends to regulate emissions of radon from such operations.

Response: The NESHAP for DOE Radon sites applies only to radon emissions from storage and disposal facilities. A flux standard per unit area per unit time is appropriate for such sites which are area sources.

4.8.5 Compliance and Implementation Procedures

No Significant Comments.

4.8.6 Costs of Compliance

No Significant Comments.

4.9 UNDERGROUND URANIUM MINES

4.9.1 Basis for the Standards (Legal/procedural Issues)

No Significant Comments

4.9.2 Dose and Risk Calculations and Analysis

4.9.2.1 Although EPA's modeling incorporates either the buoyancy effect or momentum of the air discharged from a mine vent, it does not include both effects when the air being discharged is hot.

Response: The AIRDOS code will not assimilate both buoyancy and momentum factors in the same calculation. Since buoyancy will predominate over momentum, it was used in the underground mine dose and risk calculations.

4.9.2.2 The use of 1980 census data taken during the boom period will overestimate the exposure to the nearby individual at Sheep Mountain No. 1 mine.

Response: Demography data that were obtained during a site visit to Sheep Mountain No. 1 show that the nearest individual is at a distance of 5,200 m, similar to the 6 km distance reported by U.S. Energy Corp.

4.9.2.3 AIRDOS predicts Ra-222 exposures and risks assuming the receptors in each sector were always at the center line at the plume. Proper modeling would use sector averaging which disperses the plume uniformly in each downwind sector.

Response: AIRDOS has the capability of using either the plume center line concentration or sector averaging. The latter was used in these analyses.

4.9.2.4 No effective dose equivalents are presented in the draft BID. The EPA needs to clearly state the methodology used to determine radiation dose and risk from the radon concentrations at the location of the maximum exposed individual, and allow review of the regulation to verify the calculated dose and associated risk.

Response: The methodology that the EPA used to develop the exposure and risk estimates is exhaustively described in Volume I of the EIS. The Court imposed deadline under which this rulemaking was conducted does not allow for extending the period for review and public comment. However, the Agency made every effort to provide interested parties the background information as quickly as possible.

4.9.2.5 The environmental transport of radionuclides under the CAP-88 program assumes a flat plain with no variations. Thus, the assessment is inadequate when the mine is located in mountainous areas or when the mine exhaust vent is at a different elevation than the 80 km population.

Response: The AIRDOS (CAP-88) computer code used in this assessment does assume a flat terrain and has no provisions for accommodating the conditions stated in the comment. However, this situation does not consistently over- or under-estimate the risks.

4.9.2.6 Radon emissions from uranium mine sites do not present a significant risk because radon daughters disappear into the background within short distances from the sources and few, if any, people live within the critical area of the exposure.

Response: The data provided purporting to substantiate the assertion that the daughters are indistinguishable from background within a few feet of the vent ignore the plume rise; i.e., the measurements are meaningless since they were taken at the wrong environmental location. The Agency does not ignore risks to persons simply because they live in remote locations with few other individuals subject to the risks.

4.9.2.7 Errors or omissions in characterizations of specific facilities which could affect the dose and risk calculations and assessments were pointed out; additional site-specific information was provided for use in the analyses.

Response: The EPA appreciates the additional information and has incorporated as much of it as possible into its FEIS.

4.9.2.8 The ICRP 1987 values used in the risk analysis in the EPA's proposal have not been proven to be scientifically correct and therefore are inappropriate as a basis for regulations.

Response: The Act recognizes the range of scientific opinion and uncertainty, and explicitly requires the Administrator to establish NESHAPS even when scientific certainty is not possible. The ICRP values are within the range of scientifically credible estimates, and the Administrator considers that they, along with the other estimates of radon risk provide an adequate basis for regulation.

4.9.3 Control Technology

4.9.3.1 The underground uranium mine standard requiring 30 m stacks is unreasonable. Stack height is not a significant factor in release when the air is directed vertically. The air is usually discharged at a substantial velocity and often possesses

buoyancy due to its temperature and humidity which gives an effective release height substantially above stack height.

Response: The final NESHAP establishes a dose standard. Operators are provided full discretion in the method or combination of methods chosen to assure compliance with the standard.

4.9.3.2 EPA should identify the design practices or technologies (alluded to in Sections 2.3.3.2 and 2.4.2) by which new mines can meet the proposed standards.

Response: Techniques such as retreat mining and careful placement and orientation of mine vents are just two of the design practices that could be employed. The final NESHAP permits the greatest possible operational flexibility in meeting the exposure limits.

4.9.3.3 Stacks attached to fans would have to be designed to withstand the environment, particularly the wind. These stacks will create additional air resistance which will increase the fans operating pressure and decrease the fans operating quantity. This decrease in air quantity will increase the miners' exposure to airborne radiation.

Response: If stacks are used to meet the NESHAP limits, careful design and sizing will be necessary to assure that they are suited to the environmental conditions and do not result in unacceptable exposures of miners. If mines find stacks to be unacceptable then they can use other methods to meet the standard.

4.9.4 Level of Proposed Standards

4.9.4.1 The proposed regulations will either severely limit the production of existing underground uranium mines or will shut them down. The elimination of domestic uranium production will force total reliance by the U.S. on uranium from other countries that could effect national security (nuclear powered naval fleet) and the commercial production of electricity by nuclear power plants.

Response: The final NESHAP will not cause a shutdown of the uranium industry. While the closure of some mines is possible, the final standard provides full flexibility in the method or methods selected to achieve compliance. In addition several mines are already in compliance with the standard.

4.9.4.3 The 5,000 Ci limit is not justified or proper. Most mines will not be able to comply with such a limit and most which comply will do so by dividing an ore body into separate mines instead of a single mine.

Response: The final NESHAP establishes a dose standard, with choice of compliance strategy left to the discretion of the operator.

4.9.4.4 The EPA should conduct a very careful and thorough study to determine the total impact the proposed laws will have on the uranium mining industry, and especially the adverse effects it will have on the regional economy when a mine is forced to shut down.

Response: Under the requirements of the Act and the instructions of the Court, the Administrator can only consider the impacts of the limits required to assure protection of public health in the second step of the decision making process. The NESHAP for underground mines is established at the level required to protect public health, and more stringent standards were rejected during the ample margin of safety step, in part, due to consideration of the adverse impacts of closure on local communities.

4.9.5 Compliance and Implementation Procedures

4.9.5.1 The EPA should consider continuous monitoring using a "track-Etch" type detector with quarterly exchange to determine annual emission rates. As an alternate method, grab samples (Lucas cells) on a quarterly basis should be allowed with a record of mine operating conditions at time of sampling. Another method of sampling would be to take 24-hour measurements every 3rd or 4th day. This would give about 90 days of radon values per year and enough data to average the exhausted radionuclides.

Response: Section 1.2 of Method 115 provides for the use of alternative methods upon prior approval of the Administrator. Information should be submitted demonstrating that the alternative method will provide emission data equivalent to the approved method.

4.9.5.2 When radon gas is emitted from a mine or tailings pile, it dissipates into an unmeasurable quantity above background within a few feet. Thus, the building of 30 m stacks or exhaust vent holes will not have any measurable effect on public exposure after a few feet.

Response: Radon emissions at locations near mine vents significantly exceed background levels. While concentrations at the levels required to protect public health may be below measurement levels given the ambient concentrations of radon, this in no way negates the fact the standards that are lower than background levels are required to protect public health with an ample margin of safety.

4.9.5.3 The EPA should recognize and accept alternative work practices which are capable of meeting the standards.

Response: The final rule provides the maximum degree of operating flexibility in meeting the standard by establishing a dose standard for radon emissions from underground uranium mines.

4.9.5.4 The monitoring specified in method 115 is inapplicable to situations found at some underground uranium mines, e.g., sporadic or intermittent vent fan operation, high humidity, etc.

Response: Method 115 provides flexibility for mine operators by establishing methods for both periodic and continuous operations.

4.9.5.5 EPA's definition of an active mine does not take into account the temporary ventilation of idle mines when workers enter them for inspections or maintenance purposes.

Response: EPA rule regulates all emissions from the ventilation systems of a underground uranium mines. Ventilation for inspections and maintenance is included in the standard, because the radon emitted by these operations add to the health risk to the public.

4.9.5.6 With respect to mines, the Rule is not feasible. To protect miners, MSHA requires extensive ventilation to exhaust radon from active mineworking areas in order to provide fresh, clean air. The rule would reduce the fresh air-exhaust flow through bulkhead areas resulting in higher exposure levels for underground mine workers.

Response: The rule provides sufficient flexibility to the mine operators to allow for the protection of both workers and the public.

4.9.6 Compliance Costs:

4.9.6.1 The EPA should consider the large costs of adding 30 m stacks to exhaust vents at mines that are competing in a very depressed market. This will force some mines to close.

Response: The final NESHAP allows the operator to select the most cost-effective compliance strategy.

4.9.6.2 The assessment of costs ignores higher prices in long-term contracts, maintenance costs during shutdowns, and higher unit costs of lowered production rates.

Response: The FEIS attempts to evaluate these additional costs. However, such costs vary widely since there are significant differences in the emissions and operations of the different mines.

4.9.7 Other Comments:

4.9.7.1 The EPA failed to consider mines under development, particularly in the Arizona strip.

Response: The EPA's assessment is of currently operating mines. The Agency is not aware of any changes in mining methods that will cause the emissions from mines developed in the future to be significantly different than from currently operating mines. In any event these mines will be covered by this standard.

4.9.7.2 No individuals live at the locations designated by EPA for the maximum exposed individuals at Pigeon and Kanab North mines.

Response: EPA has changed the distances to the maximum exposed individuals at Kanab North and Pigeon mines to 30,000 m and 24,000 m, respectively, reflecting the distances to Fredonia, AZ.

4.9.7.3 The attached is a report on radon measurements of actual vent holes. The point of maximum exposure here is the center of the vent hole. After a few feet, the radon daughter concentration falls off to negligible levels.

Response: The measurements were taken between 4 feet and 10 feet from the ground within 8 feet of the vent, which extended 4 to 5 feet above the ground. It is obvious that the radon from the vent was passing well over the point of measurement due to plume rise.

4.10 SURFACE URANIUM MINES

4.10.1 Basis for the Standards (legal/procedural issues)

4.10.1.1 The mining of uranium ore is conducted under general license from the Texas Department of Health and regulated under Texas rules for the control of radiation. The statement to the contrary in 12.1.2.2.3 of the BID is incorrect. There are regulations for mine reclamation by the Texas Railroad Commission which specify the radiation levels on the surface of the mine at the time of bond release.

Response: According to cognizant state government personnel the statement in the FEIS is correct.

4.10.2 Dose and Risk Calculations and Analysis

No Significant Comments.

4.10.3 Control Technology

No Significant Comments.

4.10.4 Level of Proposed Standards

4.10.4.1 The Nuclear Regulatory Commission and the Agency have funded several studies to monitor radon concentrations near open pit uranium mines over the last decade. These reports show that anything lower than the existing standard will be extremely difficult to control without increasing the health risks to the very people who are required to control the problem.

Response: No NESHAP is promulgated for surface uranium mines.

4.10.5 Compliance and Implementation Procedures

4.10.5.1 The monitoring specified in method 115 is inapplicable to situations found at some surface uranium mines.

Response: No NESHAPS is promulgated for surface uranium mines.

4.10.6 Control Technology and Compliance Costs

No Significant Comments.

4.10.7 Other Comments

4.10.7.1 There are only two open-pit uranium mines in production in the United States. These mines are required to help produce the nation's uranium requirements to fulfill nuclear power needs for industry and the country's defense establishment.

Response: The Agency is aware that currently only two conventional open-pit uranium mines are in operation.

4.11 PHOSPHOGYPSUM STACKS

4.11.1 Basis For the Standards (Legal/procedural issues)

4.11.1.1 The ORP's plan to propose a standard for phosphogypsum stacks was not based on a determination that such a regulation is necessary and appropriate for protection of public health. We understand that the ORP agreed to propose a standard solely in order to obtain an unopposed extension of time to the court-imposed schedule in Environmental Defense Fund, Inc. vs. Lee M. Thomas.

Response: Although the commentor is correct that EPA agreed to propose a standard for phosphogypsum, it is not true that it was done "solely" to get an extension. The Agency was already working on this source category and was considering it for regulation. EPA is under no court order to promulgate a final standard for this category. The decision to do so is based solely on the risks presented by phosphogypsum stacks to public health.

4.11.2 Dose and Risk Calculations and Analysis

4.11.2.1 The risk estimate source term should include a recognition of the radon not emitted from the stack area due to the natural radon the stacks and associated ponds seal off.

Response: Correcting the source term for background radon flux (0.2 to 0.3 pCi/m^2-s) from the area beneath the stack would result in an insignificantly small reduction in risk estimates.

4.11.2.2 The BID states, "For one section of Florida, it is estimated that the number of persons exposed is overestimated by a factor of seven, while the risks are understated by a factor of three." A similar but less severe problem exists in the assessment for the multiple stacks in southeastern Idaho. Better models that would resolve this overlap problem should be used.

Response: New modelling approaches are needed to estimate the risk from multiple sources. However, until they become available, the existing models provide the best estimates of risks. The case study of over-lap in the central Florida area was conducted to place an upper-limit on the degree of underestimation of individual risks. As pointed out, multiple sources do not affect the estimate of committed fatal cancers, as the effects are simply additive. The only effect of this treatment of multiple sources is on the estimate of maximum individual risk. Since the phosphogypsum stack with the maximum individual risk is in Louisiana, any error this might have caused is insignificant.

4.11.2.3 The EPA has performed the assessment analysis assuming a release height of one meter while phosphogypsum stack heights range from 10-60 m. We believe an appropriate and easy-to-use adjustment would be to assume the height of release is one-half of the physical stack height. This would result in a more realistic assessment.

Response: The correct modeling of a non-uniform volume source is uncertain. The 1 meter release height was chosen to assure that the risks to nearby individuals are not significantly underestimated. Moreover, as explained in the EIS, the sensitivity study that was made shows that even if the commentor is right, the estimated risk to nearby individuals would only be significantly overstated for one stack.

4.11.2.4 The EPA must use site-specific data in its analysis of radionuclide emissions from phosphogypsum stacks.

Response: The EPA used site-specific data at all phosphogypsum stacks where such data was available. This included stack size and shapes, flux measurements, radionuclide content, stack conditions, etc., made available by on-site visits, company replies, and The Fertilizer Institute (TFI). In some case information provided during the comment period resulted in changes to the inputs to the risk assessment.

4.11.2.5 The EPA's assumptions concerning stack geometry are all no more than approximations. It is doubtful whether any one actual stack exhibits the EPA's assumed geometry.

Response: The EPA exerted considerable effort to obtain site-specific information to use in computing the source terms for the phosphogypsum stacks and information obtained from discussions with company employees. From our observations and input from the company officials, we developed a generic stack with length (not height as TFI states) twice the width and a 1:3 slope to the sides. Most stacks we have seen do approximate a rectangular configuration. We made many inquiries to companies, as well as to TFI, for specific stack data, including stack dimensions and slope of the sides. We received an excellent response to our inquiries from some companies, and either poor or no response from others. It is not easy to obtain this information from most companies, as indicated by TFI's efforts to get the slope of the sides of stacks as reported in their comments. Apparently they were able to obtain the slopes for only 27 of the 63 existing stacks. When we had specific stack data it was used in the assessment. For those stacks that specific information had not been made available, we had no choice but to use generic parameters.

4.11.3 Control Technology

4.11.3.1 Allow maximum flexibility in determining how much reduction is required at any given facility and how it is achieved. For example, it may not be necessary to cover the entire stack to meet the standard.

Response: The standard does allow such flexibility.

4.11.3.2 The radon flux from soil cover will affect the depth of cover necessary to attain a radon flux goal, and would increase the costs over that estimated by the EPA. This will require site-specific consideration.

Response: Site specific considerations will be necessary in all cases to assure compliance with the standard. Soil cover should contain approximately background levels of radium and add insignificantly to the radon flux.

4.11.3.3 The soil moisture assumed in the cover by the EPA is about 3 times greater than that seen in Florida soils, which would double the thickness to achieve the same emanation rate increasing the soil cover cost by 100%.

Response: The estimated soil moisture used by the EPA is based on an empirical correlation that uses annual average rainfall and evaporation rates.

4.11.3.4 The haulage distance for dirt to cover the stacks cannot be based on a generic evaluation (10-mile round trip), but must be determined on a case-by-case basis.

Response: EPA did not attempt to estimate costs for each pile. Rather a generic pile was developed based on average conditions. This approach is adequate for rulemaking since it is the incremental costs that are important in considering progressively more stringent controls. These incremental costs are much less sensitive to errors in the generic pile than total costs.

4.11.3.5 The rule should allow consideration of alternative risk control methods other than covering the stack with dirt.

Response: The operator is free to use any method that will permanently meet the radon flux standard from the stacks.

4.11.3.9 The EPA should recognize that 1) phosphogypsum in north Florida has 50 - 75% less radium than assumed by EPA based on the radium content of rock from other Florida areas; 2) a soil density of 1000 to 1200 kg/m3 would be more appropriate that the 220 used; and 3) environmental weathering is commonly represented by a 14-day half-life rather than the 35 years used.

Response: The FEIS has been amended to reflect the lower radium content of north Florida rock. The soil density used is appropriate for phosphogypsum stacks. The 1000 to 1200 kg/m^3 cited reflects the specific gravity of typical soils while the 200 kg/m^3 used by the EPA reflects the bulk density of typical soils.

4.11.4 Level of Proposed Standards

4.11.4.1 The EPA should allow an alternative standard of 0.5 pCi/L radon at the stack's edge.

Response: This standard would be very difficult to measure on an average annual radon concentration basis considering that background concentrations in central Florida range from 0.14-5 pCi/L and the uncertainties associated with measuring ambient airborne radon concentrations. For example, consider the case of Seminole Fertilizer Corporation's south stack which is surrounded by reclaimed land that resulted in a measured base perimeter radon concentration of 0.7 pCi/L (see EPA 520/5-88-021).

4.11.5 Compliance and Implementation Procedures

4.11.5.1 The EPA failed to consider the radiation exposure to an individual caused by the soil which would be placed on top of the stack. This is important in evaluating Approach D (I-60).

Response: Because there is very little radium in soil that should be used for cover it would not have a significant effect on health and it will have little effect on compliance with the standard since Approach D was not selected.

4.11.5.2 We do not believe more than 20 samples for each category (sides, beaches, roadways, etc.) are warranted. It would be better to require more than one set of measurements since the flux is affected by meteorological conditions. Alternatively, the number of measurements should be based on the stack area. For example, on a 9 ha stack this would amount to one measurement per 300 sq m, while the EPA's long-term study (EPA 520/5-88-021) made one measurement per 78,000 sq m. We recommend making one measurement per 10,000 sq m.

Response: The number of samples required for each category is based on EPA's report 520/5-88-021.

4.11.5.3 Section 3.1.2 requires a minimum of 300 measurements to characterize the radon flux from the phosphogypsum stack. This is contrary to the conclusion in the EPA's background document, A Long-Term Study of Radon and Airborne Particulates at Phosphogypsum Stacks in Central Florida.

Response: The cited EPA document considered only the loose, dry area of the top surface. The rule considers the total stack consisting of 5 regions. The conclusion was made that 100 measurements adequately defines a mean flux over a large area with large flux variability, while fewer measurements will adequately define a smaller area with less variability.

4.11.5.4 The EPA should make it clear that emissions limits are applied to closed stacks and not to operating stacks.

Response: The final rule clarifies this point.

4.11.5.5 Retesting should be required on a non-regular basis to better provide for testing over all seasons of the year. Also, if initial testing indicates non-compliance, the operator should be allowed to conduct three additional tests at three-month intervals and report the results of each test as well as the average radon flux for all four tests. Compliance should be based on the four-test average.

Response: The final rule provides flexibility by allowing for either periodic or continuous measurement.

4.11.5.6 The proposed rule does not specifically identify what would constitute a stack no longer in use and therefore subject to the standard. However, the language of proposed Section 61.203(d) indicates that EPA may view the discontinuation of the actual placement of phosphogypsum on the stack with the cessation of the use of that stack. This view is not correct. The rule should not restrict a company's ability to use the surface area of a phosphogypsum stack for water management purposes even though the stack or a portion of the stack is no longer regularly used for the placement of phosphogypsum.

Response: The definition of when a stack is subject to the NESHAP has been clarified in the final rule. The rule specifies that stacks used for water management are still in operation and do not need to be tested.

4.11.6 Compliance Costs:

No significant Comments

4.11.7 Other Comments

4.11.7.1 No 1987 flux measurement results were used in the assessment. The EPA used only measurements made in 1988.

Response: The 1987 data were not used because EPA was uncertain where the measurements were made, what procedure was used, and they were few in number.

4.11.7.2 The EPA assumed a stack side slope of 1 to 3, whereas the side slopes of the Swift Creek and Swannee River stacks are 1.2 to 1 and 1.5 to 1, respectively.

Response: EPA regrets that this information was not received in time for the final risk assessment.